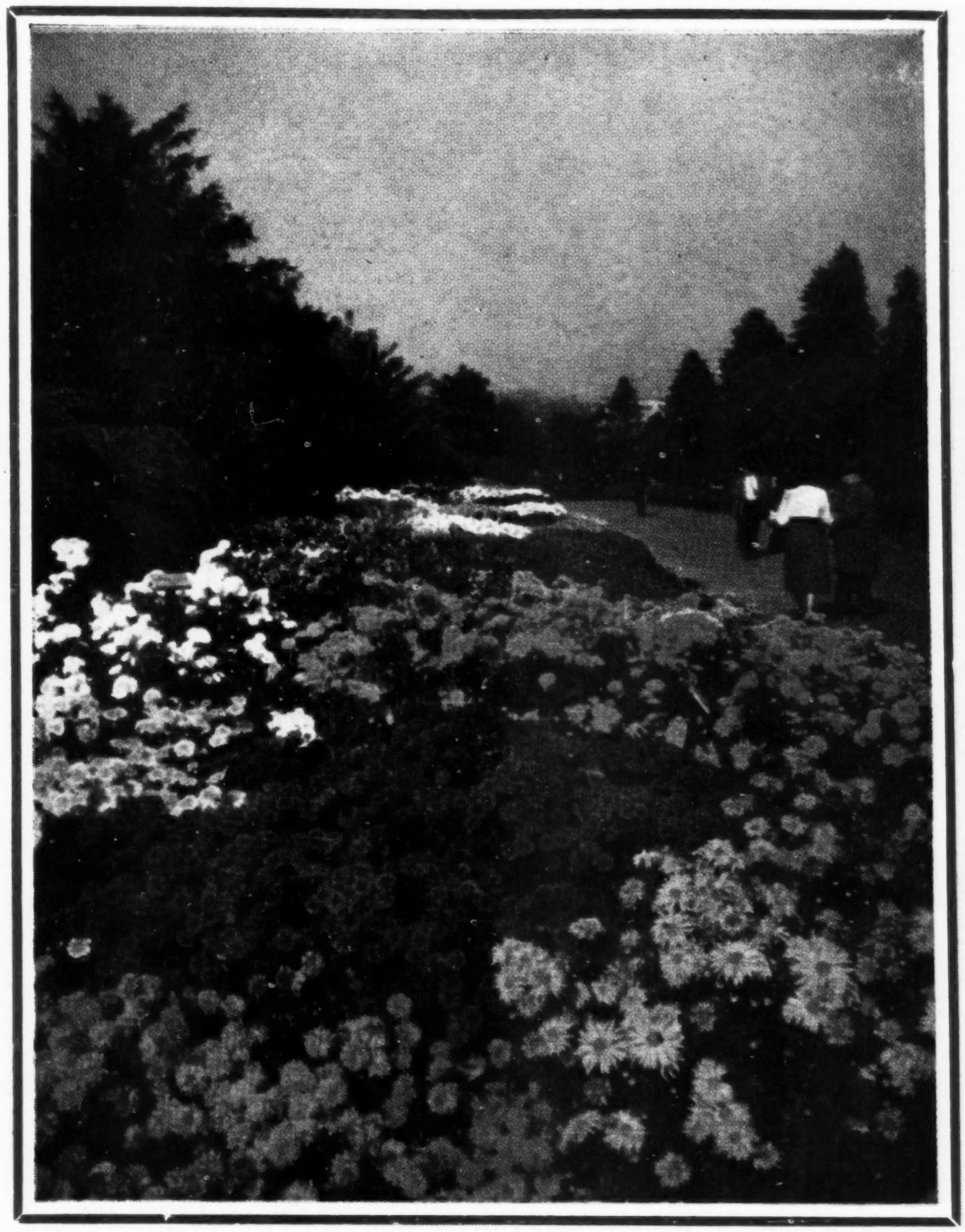
The Garden Journal

of the New York Botanical Garden



Vol. I, No. 5 Sept.-Oct., 195

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Oct. 26, 27, 28, 1951—Seventh Annual Chrysanthemum Show and Program at The New York Botanical Garden, with the cooperation of the Regional Chapters (in the metropolitan area) of the National Chrysanthemum Society.

Nov. 2, 1951 — and continuing for three week-ends — Chrysanthemum Show in the Conservatory of The New York Botanical Garden.

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THE GARDEN JOURNAL

of The New York Botanical Garden

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AMONG OUR CONTRIBUTORS

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CREDIT FOR ILLUSTRATIONS

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The Garden Journal of The New York Botanical Garden is published bimonthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Re-entered as Second Class Matter, February 1, 1951, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription $2.00. Single copies 35 cents.

This is the time of year when elms wear most profoundly
Their air of revery.
Drooping over the tarnished slopes of late summer,
Above stone walls and terraced lawns and gardens,
And against the aster-blue profiles of distant mountains,
In elegiac grace, exquisite and aloof.
It is a time when meadows are composed
In dreaming gardens of dim pearl, opaque rose, bright gold and violet —
Goldenrod, Joe Pye, ironweed and boneset,
Their curded cymes and panicles pierced by the slender spears
Of water reeds,
Where a brook creeps stealthily, unseen and mute
Breathing a scent of mint —

Clara Shanafelt.

THE CHRYSANTHEMUM

500 B.C. to Now

THE chrysanthemum is such a popular and common flower in modern American gardens, it is startling to know that at one time a new variety brought the price of fifteen hundred dollars. Even before that event, enormous difficulties had been overcome in making chrysanthemums available to the western world at all.

It is generally accepted that *Chrysanthemum indicum,* native to China, is the original flower from which our cultivated varieties have come. The chrysanthemum can be traced through Chinese literature from the time of Confucius, the remarkable philosopher who is supposed to have lived about 500 B.C., and in Japanese literature from the eighth century. An interesting Chinese legend explains the presence of the flower in Japan. According to mythology, an astrologer informed a Chinese emperor that on "the Dragon-fly Island in the Sunrise Sea" there grew a magic herb which could restore his youth. Twelve men and twelve women volunteered to cross the treacherous sea to barter for the herb. They took with them China's greatest floral treasure—golden chrysanthemums. When the travelers finally reached the island, they found it uninhabited. Memories of the terrible sea monsters they had encountered on the ocean decided the adventurers to settle on the island rather than risk the fearful journey home. The golden chrysanthemums were the people's only link with their native land and so they carefully propagated the plants through the years.

The chrysanthemum has been used for centuries as a decorative motif in both China and Japan. The "Order of the Chrysanthemum" was established in 1876 by one of the mikados. This emblem of honor was bestowed only upon sovereigns and officials of the highest rank. It consisted of a "star in the form of a cross with thirty-two rays. In each of the angles formed by the four principal arms a chrysanthemum flower is located." The Japanese so esteem the chrysanthemum they have made it their national flower and one of their gayest holidays is Chrysanthemum Day. On this feast, people float petals of the flower in their "saki" before drinking. The custom is supposed to bring good luck, health and happiness to all who practice it.

Exactly when and how the chrysanthemum was introduced to Europe is difficult to say. The earliest record establishes 1688 as the date the plant was first cultivated in Holland. Jacob Breynius, a merchant of Dantzig, mentioned the two types he had acquired under the name of *Matricaria japonica.* However, there is some question as to whether these were the large-flowering chrysanthemums we know. If they were, it seems odd that such good gardeners as the Dutch should have allowed the strain to die out and be lost to European gardens for nearly a century. It is true that dried specimens were introduced in

Several forms of *Chrysanthemum indicum* are portrayed by Gaetano Savi in *Flora Italiana*, Pisa, 1822.

England by James Cunningham in 1698, but it was not until 1789 that chrysanthemums got their real start in Europe. A merchant of Marseilles, M. Blanchard, introduced three varieties from China, one white, one violet, and one purple. Only the last survived. Immediately, "Old Purple," as it was named, caught on in France and before long was being distributed in England by Messrs. Covill of Chelsea. "To them we are indebted to this forerunner of all the wealth of color and form now so familiar."

By 1826 there were forty-eight varieties of chrysanthemum in cultivation in England. A widespread interest and enthusiasm in these plants was growing. Gardeners were avid for new varieties. But the chrysanthemum is native to China and China at the time was practicing a policy of exclusion and seclusion. True, an edict of 1685 had opened all Chinese ports to foreign trade, but twenty-five years later this did not mean a thing. So many impossible regulations abounded that foreign trade was practically suspended. Commercial agents in China found their freedom of movement very restricted in the few cities that were open to them at all. This state existed until after the Opium War between England and China in 1840.

As an aftermath of this war, representatives of trading firms and visitors were permitted to travel in China much more freely than before. The Royal Horticultural Society in England, taking advantage of the favorable conditions, in 1843 sent Robert Fortune there to search for rare plants. He returned in 1846 and among his collections were two small-flowered chrysanthemums, *C. minimum* and the Chusan daisy. These were not received enthusiastically in England but the French admired them greatly. The plants gave origin later to many beautiful varieties. It is believed that our present day pompons originated from this group.

Chrysanthemums have been popular in American gardens for many years. Eighteen varieties were recognized by the time the Massachusetts Horticultural Society was incorporated in 1829. Since then, their number has increased manyfold. The story of one variety that proved a favorite in the United States was told in the Missouri Botanical Garden Bulletin some years ago:

"Perhaps the one thing which brought the Chrysanthemum into prominence and helped to establish it as a favorite Fall flower was the appearance of the new variety, Mrs. Alpheus Hardy. The fact that this new variety brought the unprecedented price of $1,500 did much to advertise the flower, although the history of its introduction may have had something to do with this. It was recorded that Alpheus Hardy, a sea captain sailing from Japan to Boston, discovered a stowaway whom ordinarily he would have been compelled to return to Japan. However, due to the intercession of Mrs. Hardy, who was aboard, the captain continued his journey to Boston, and the stowaway was educated at Harvard University by Mrs. Hardy. Upon returning to Japan, the stowaway, wishing to show his appreciation of what had been done for him, sent to Mrs. Hardy a collection of cuttings of chrysanthemums. These were turned over to a florist in Cambridge, and the first white hairy or ciliated type ever grown in this country resulted. It was named Mrs. Alpheus Hardy. Some fifty varieties, most of them American grown hybrids, have been developed from this original hairy type."

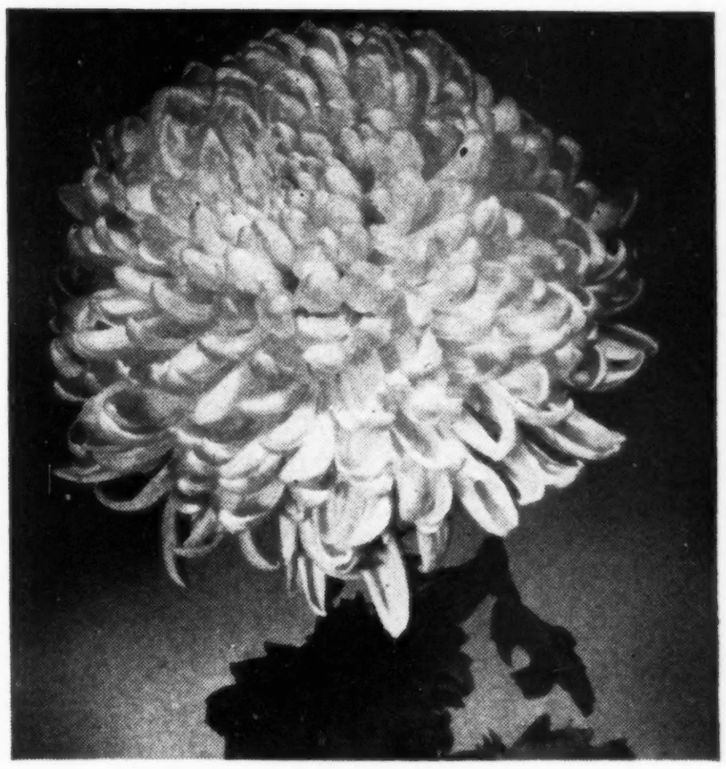
Eighteen varieties were recognized in 1829, and many, many more in 1951, for down through the years an extraordinarily large number have been bred, differing in size, form and color. Some have not possessed that certain quality which makes a very fine chrysanthemum, and so, after a year or two, they have faded out of the picture. Others have performed satisfactorily and have remained in good standing with chrysanthemum growers. Long-

time favorites, for instance, are White Doty, Lillian Doty, Major Bowes, Nuggets, Pink Dot, Ambassador, Lavender Lady, Silver Sheen and Mrs. H. E. Kidder. The last variety, introduced in 1930 by the late Elmer D. Smith, well-known chrysanthemum breeder, led the "one hundred best chrysanthemums" for the third time in 1950 in the popularity poll of the National Chrysanthemum Society.

The New York Botanical Garden for the past six years has maintained trial borders where new varieties from chrysanthemum specialists in different parts of the country are grown. It is interesting to note that four of the new varieties in last year's trial borders placed among the first fifty in the 1950 list of "100 best chrysanthemums". These were Kathleen Lehman, Patricia Lehman, Masquerade and Meditation.

Again this year the trial borders contain new varieties — more than fifty of them. From the middle of this month until the middle of November, depending, of course, upon frost, visitors to The New York Botanical Garden will be able to see for themselves whether these chrysanthemums live up to expectations. They have come from Bobbink & Atkins, Bristol Nurseries, Conard Pyle Company, Corliss Brothers, Omar Coles, Sr., of the Echo Valley Floral Gardens, Jackson & Perkins, Lehman Gardens, Yoder Brothers, and the U. S. Department of Agriculture. The Bureau of Plant Industry of the U. S. Department of Agriculture at Beltsville, Md., has been working on outdoor chrysanthemums for some years under the direction of Dr. S. L. Emsweller, developing worthy varieties and testing them for hardiness in different sections of the country. Some of these new chrysanthemums are recommended by the Department of Agriculture to be grown only in northern states, others in southern states, and still others in northwestern states.

A solid border of chrysanthemums makes a magnificent autumn display and, from the fancier's point of view, is the only practical way in which to grow them, for there they can be given sufficient room so that light and air may reach the entire plant and thus enable the foliage to grow and remain green right down to the base. There



Chrysanthemum Mrs. H. E. Kidder has led the popularity poll of the National Crysanthemum Society for three years.

they can also be shaded and the more tender varieties furnished with such protection as may be necessary.

Not every garden, however, permits allotting an entire border to one flower and so chrysanthemums are frequently included in the perennial border. Some amateur gardeners let the plants remain undisturbed in the same position in the perennial border for several years. This is not good practice—and is an invitation to nematodes which are the cause of brown, sickly-looking foliage. It is better to lift the plants each spring, dividing them into single strong shoots with sturdy roots attached, and then shift the divisions to another part of the border.

Condensed into a few words, what chrysanthemums need in order to perform properly are: an open sunny location; a well-drained soil, enriched with humus (or leafmold or well rotted manure); watering during dry spells; feeding at regular intervals (about once a month) with a complete plant food; pinching back to form stocky plants; disbudding to reduce the number of buds and to encourage the remaining to develop into better-sized blooms.

Tampico is one of the varieties of chrysanthemums which have recently been developed by the U. S. Department of Agriculture.

WHITE PINE

Backbone of the Early American Lumber Industry

By Edmund H. Fulling

This white pine on a rocky situation along the Atlantic seaboard has been buffeted by strong winds.

MUCH has been written about the the majestic and awe-inspiring redwoods of California and about the great cedars of Lebanon that built Solomon's temple, but nowhere in the world is there another kind of tree that has been so intimately associated with the lives of millions, with the building of a nation and with the rise and fall of fortunes as has the white pine of eastern North America. Cradled in its wood, literally and figuratively, the course of empire moved westward after it once became established along the North Atlantic seaboard of what was to become the great land of opportunity, and no small part of that opportunity was embodied in the countless millions of these trees that once covered America from eastern Canada westward to Manitoba and south along the Appalachians to Georgia. It has been said that a squirrel might have traveled from Maine through New England and New York to western Pennsylvania, leaping from pine to pine without ever touching the ground, so continuous was the stand of these trees. In them lay an enormous reservoir of a great natural resource, and the exploitation of that resource for three hundred years constitutes one of the great sagas in the annals of plant utilization.

Just when that saga began may not be known precisely, but for our purpose it was one day in 1605 when Captain George Weymouth of the British Royal Navy sailed his vessel up one of the rivers in Maine and, perhaps as the first Englishman, spied the stately trunks of white pines, towering straight as an arrow for one hundred fifty or more feet. It is of historical interest, of course, that he returned to England with seeds and perhaps young trees, that these were planted at Longleat, the estate of Thomas, Viscount Weymouth, second Marquis of Bath, and that since then our eastern white pine has been known in England as "Weymouth Pine". More important was the fact that Captain Weymouth as a navy man saw in those trees wonderful material for masts and that he returned with specimen logs for that purpose to be displayed to the Royal Navy authorities.

To appreciate the significance of this, it must be borne in mind that England at the time was almost continually at war with other navies of the world, that the masts of her ships defending her title as mistress of the seas were made of Riga fir (Scots pine, *Pinus sylvestris*) from the Continent and that Prussia, Russia and Sweden controlled the sources of that timber; the Danes, too, were to be considered, for they were in a position at any time to cut off the entire supply by closing the waterways from the Baltic. Furthermore, the masts of Riga pine were not of single trunks of trees but were pieced together. No wonder, then, that a sensation was stirred up in the Navy Board when it was found that in England's own colonies there were apparently inexhaustible supplies of mastwood in single pieces and free of control by foreign powers. Before long, contracts were let to American agents for these great sticks, some of which sold for as much as £100 apiece, and more than one of those agents waxed wealthy and in the favor of the king's men.

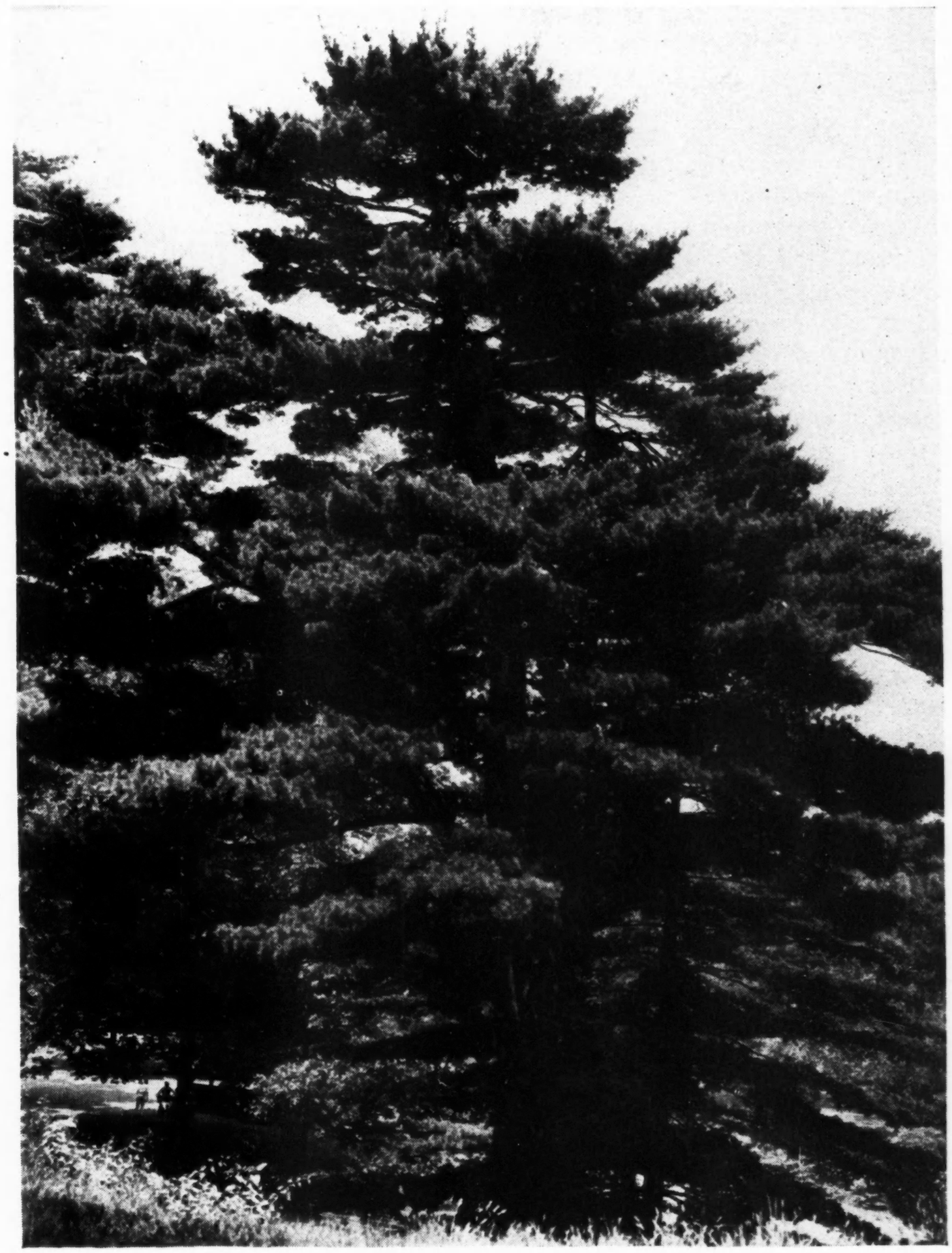
It was not long before the concern of the Royal Navy in the great white pines conflicted with interest in them on the part of the colonists, particularly when the latter began to move westward into so-called "Crown Lands", reserved to His Britannic Majesty for sale, most likely, to London land speculators. Those westward-moving colonists cleared the land and felled the trees, sometimes to use them, more often, perhaps, only to burn them in

making room for farms. The Royal Navy was desperately in need of the trees, and one proclamation after another was promulgated in efforts to maintain control of them. Finally, John Wentworth of New Hampshire, one of the faithful who had furnished the great sticks to His Majesty's ships, was appointed Surveyor General of His Majesty's Woods in America, with the authority to mark a blaze, known as the King's Broad Arrow, on every great pine in America and thereby to reserve its use exclusively for His Majesty's navy. He faithfully carried out his mission and thereby infuriated the pioneering colonists hardly any less than their coastal brethren were infuriated by the Stamp and Townsend Acts. The Broad Arrow was held in such contempt by American woodsmen who obliterated and disregarded it in felling the reserved trees, that the Crown retaliated in 1761 by imposing penalties in all subsequent land grants for cutting without license "all white or other Sort of Pine trees fit for Masts, of the growth of 24 inches Diameter and upwards at 12 inches from the Earth". The law was to be enforced by a system of spies who were to be rewarded by being given the land grants of the violators, but violations continued and many were the regrettable incidents between enraged loggers and law enforcers.

Nevertheless, as in very recent times, there were many who traded with the potential, if not actual, enemy and continued to reap rewards for furnishing great masts for His Majesty's ships. When the clouds of rebellion began to gather, however, there were those among the latter who foresaw that their own white pines might come back as masts of ships laden with hostile troops. Finally, in 1774, the governing body of the rebelling colonists prohibited export of everything, mastwood included, to Britain. The last cargo of American white pine reached England shortly after Bunker Hill, and from then on, jointed masts of Riga fir had to suffice again for the Royal Navy. And, as if to add insult to injury, the first flag of the American Revolutionary forces bore a white pine for its emblem, and Captain John Paul Jones carried the war to Britain's shores in his ship, the Ranger, with three of the tallest white pine masts that ever went to sea.

While the demand for ships' masts and spars were a great stimulus to the young American lumber industry, they were by no means the only outlets for white pine timber in colonial days and the years immediately after. Domestic needs for cut lumber grew by leaps and bounds, not only for the countless frame homes that were to become so characteristic a feature of early American culture, but also for the countless other items that were also a part of that development. And for all those needs, white pine was the wood *par excellence*. In 1631, the first sawmill in America was set up at Berwick, Maine, though an earlier one has been reported to have been at Jamestown, Virginia, in 1625. That early one in Maine and others that followed were, of course, a far cry from those of today, for they were of the water-wheel type, with a slow-cutting single sash saw producing only a few hundred board feet per day. Nevertheless, they began a chapter in exploitation that has hardly been equalled and certainly not surpassed anywhere else in timber usage.

Every nation must have export trade



White pines stand near the path leading to the rock garden at The New York Botanical Garden.

of some sort, and the young American nation up to the middle of the seventeenth century had been able to send abroad only fish and furs. Manufactured goods were still things of the future, even tobacco and cotton had not yet been developed, and the products of the mushrooming sawmills, as they multiplied through the north woods and converted the great trees into planks, met the need. Within fifty years, New England was selling her virgin forests as masts and cut lumber not only to England but also to Portugal, Spain, Africa, the West Indies and even to densely forested Madagascar. Maine soon became the leader in world trade in lumber and has since been known as the Pine Tree State. By 1850, however, the mills had become so abundant in that state and the demand for white pine spars, staves and lumber so great that mill owners began to look for new stands of virgin timber. They gradually moved westward, and in 1850 New York took over as the leader, producing in the Adirondacks about twenty percent of the country's lumber needs. Ten years later Pennsylvania, with its enormous area of virgin pine forest, became the leading state. Operations still continued, of course, in New England and New York, but there was always the lure of untapped virgin stands of pine farther west. Pennsylvania, too, was destined to be superseded, and in 1870 the industry straddled the Great Lakes and jumped to the virgin pine forests of Michigan where the timber stood 10,000 to 40,000 board feet to the acre but sold frequently for as low as one dollar per acre. In 1880 operations were concentrated in Wisconsin, and in 1892 lumber production, almost exclusively of white pine, reached its peak in the Lake States with a production of nine billion board feet. That, in brief, was the westward course of empire in the American lumber industry founded upon eastern white pine. From the Lake States in 1892 that industry gave way to a new one based upon southern yellow pine, and in the succeeding exploitation lies another tale of timber utilization.

The Other American White Pines

White pines are those pines which, among other features, have needles in clusters of five. More than a dozen kinds of pine displaying this character are known throughout the world. The eastern white pine (*Pinus Strobus*), which we have just considered, is the only one of them in the eastern United States. In the western states its counterpart, western white pine (*P. monticola*), extends from British Columbia into Idaho and California; and a second western American five-needled species, sugar pine (*P. Lambertiana*), extends from Oregon through California into Mexico. These western trees, too, are giants of the forests, one hundred and more feet tall. Their utilization is of more recent development than that of their eastern relative and, consequently, has not been embellished with such historical lore as is associated with the latter. Since the wood of all three is very similar and usually is not distinguished in the trade, their modern usage will be considered together in the following section.

Characteristics and Uses of White Pines

The great heights and straightness of virgin pines in American colonial days may alone have been sufficient to render them unequalled as mastwood in the days of sailing vessels, but along with those qualities was an unusual combination of great strength and relative lightness in weight such as no other part of the world was then producing. Combined with the lightness and strength was a smoothness and softness of grain, especially pronounced in what the colonial woodsman called "pumpkin pine" that was carved into the ornate figureheads which decorated the prows of the ships with their great masts of pine. The distinction between "pumpkin pine" and the coarser grained wood was profound to the New England wood carver, and the quality which he so greatly valued in the former, probably non-existent today, may have been a product of centuries of undisturbed virgin timber growth. From shingles for the Pilgrims to the exquisite fanlights of later wealthy homes, white pine entered into the manufacture of countless articles during the eighteenth and nineteenth centuries, and even today, in the twentieth century when the western pines and other woods offer competition, and the virgin stands are gone, second growth pine still has a market.

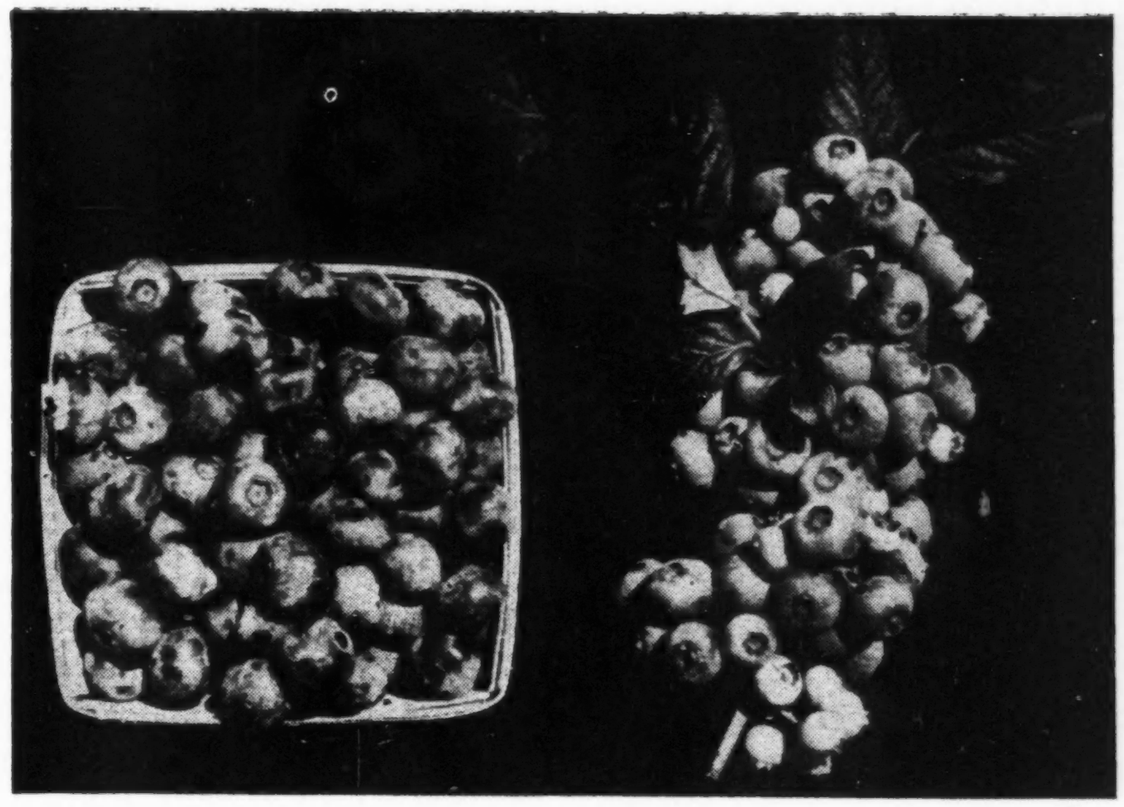
The manufacture of boxes and crates, of sash and doors, of toys, woodenware and novelties, of signs and of caskets still utilizes the eastern white pine that becomes available, and for foundry patterns it is the standard wood because of its uniform texture, ease of cutting in any direction, minimal shrinkage and swelling, ability to stay in place, ease of gluing, freedom from resin, and strength to withstand rough handling. Building construction formerly relied heavily upon this wood, but scarcity of suitable stock has directed that market elsewhere. Formerly, too, eastern white pine was the leading wood in manufacturing matches but now western white pine enjoys that distinction. In 1940 this latter species contributed over ninety percent of more than eighty-one and a half million board feet that went into matches and matchboxes that year. It enters also into boxes and crates, building construction, millwork, patterns, car construction, fixtures and caskets. The wood of suger pine enters the same manufactured products, and that of all three contributes about seventy-five percent of the wood going into wood flour, that is, extremely finely ground wood used in the manufacture of linoleum, nitroglycerine explosives, plastics and other molded products.

The white pines have never been important as producers of products other than wood in various forms, but the secondary products that they have yielded merit mention at least in concluding this brief treatment. In 1605 the French colonists of Nova Scotia initiated the American naval-stores industry by distilling a crude turpentine from the oleoresin of white pine, but southern yellow pines soon became the principal source of this product. The dried inner bark of eastern white pine has long been used as an ingredient in cough syrups, and an actively purgative exudation was at one time collected by Indians from incisions in the bark of sugar pine in Oregon. Finally, it must be noted, the bark of white pines contains a glycoside, coniferin, which when hydrolyzed yields coniferyl alcohol, and this product has been utilized through oxidation as a commercial source of synthetic vanillin.

The Cultivated Highbush Blueberry

A Relatively New Fruit

By Franklin A. Gilbert



Blueberry Coville is a variety recently introduced by the New Jersey Experiment Station and the U. S. Department of Agriculture.

As the title of this article suggests, the cultivated highbush blueberry (*Vaccinium corymbosum*) is a new fruit, especially when considered in terms of apples, grapes, strawberries, and other fruits. It is true that blueberries have been harvested from the wild for many years but it wasn't until 1906, when Dr. Fredrick V. Coville, Principal Botanist, Bureau of Plant Industry, U. S. Department of Agriculture, began experimenting with this fruit, that thoughts of cultivated blueberries began to crystalize.

By the end of 1910, Dr. Coville published the first bulletin on blueberries. It was entitled, "Experiments in Blueberry Culture". Before writing it, the eminent botanist had established the fact that blueberries thrive in acid soil; had grown fruits from seed to seed; propagated selected plants by grafting, budding, division, layering, twig cuttings, and root cuttings; had devised and applied methods of pollination; and had selected wild plants with superior qualities for breeding experiments.

The first attempt at improvement through breeding was made in 1909 and 1910 when the variety Brooks, a selection from the wild, was self-pollinated. This attempt was unsuccessful and it was not until 1911, when Brooks and Russell were cross-pollinated, that a seedling progeny was obtained.

Fortunately, about this time, Miss Elizabeth White of Whitesbog, New Jersey, read Dr. Coville's bulletin and offered to cooperate with him in a breeding project. The offer was accepted and the two persons who were to mold the future of the blueberry industry for many years met in New Jersey in March, 1911.

The late F. V. Coville and Miss Elizabeth White are seen examining a blueberry selection at Whitesbog, New Jersey.

One of the first things that had to be done was to find the most promising wild seedlings to be used for parents in the breeding work. In the summer of 1911, Miss White, working through two agents, Jake Sooy and Alfred Stevenson, offered a dollar each to pickers who could tag bushes having fruits of a specified size and take her to them. In addition to the one dollar, the pickers were paid for the time involved in finding the bushes again, usually amounting to half a day's pay. At first the size requirement was set at one-half inch, but a little later was raised to five-eighths of an inch. Two bushes were found which produced berries three-quarters of an inch in diameter, although both were later discarded because of other faults. One variety, later named Sooy, was discovered in 1911. In 1912, other varieties were brought in, including one found near Chatsworth by Rube Leek. This was later named Rubel and became the leading commercial variety. All in all, an even hundred wild seedlings were brought in by Miss White through the cooperation of various pickers. Besides Rubel, the following were named and planted commercially — Adams, Dunfee, Grover, Harding and Sam.

Probably the first successful commercial planting of blueberries was made in the spring of 1912 on the Whitesbog property. A portion of this

original field is still standing near Miss White's residence.

For a number of years, practically all of the seedlings from crosses made by Dr. Coville were planted at Whitesbog. At one time there were over fifty acres of such seedlings in the field. As a result, most of the present named varieties have been developed from plants which were grown on the White property.

Beginning in 1928, Miss White started a breeding project of her own and has since raised hundreds of thousands of blueberry plants from controlled crosses. As yet, no varieties have been named from her extensive project, but, in the writer's opinion, she has a few selections which are superior to many of the present named varieties. Miss White still resides at Whitesbog and, although no longer actively engaged in blueberry breeding, has a wealth of knowledge which she enjoys sharing with interested persons.

Since Dr. Coville's untimely death in 1937, Dr. G. M. Darrow, Principal Horticulturist, Bureau of Plant Industry, U. S. Department of Agriculture, has greatly aided in the development of this fruit. Coöperating with Dr. Darrow have been men from the various experiment stations, with the New Jersey Experiment Station being the most active.

From all of these rather concentrated efforts — and it has only been forty-five years since the industry was in the "idea" stage — twenty-eight varieties have been introduced. Many of the older selections have fallen by the wayside, due to continued improvement, but Rubel, one of Miss White's selections from the wild, is still grown quite extensively. The last two varieties to be named are Berkely and Coville. They are superior to the older varieties in many qualities, but in themselves are not perfect. Therefore, improvement through breeding is still being actively carried on and within the next few years, additional varieties will doubtless be introduced.

An upland blueberry planting is grown with a heavy mulch at the New Jersey Experiment Station, New Brunswick, N. J.

Not all areas have suitable conditions for commercial production, which means that the industry is quite limited as to the number of states producing blueberries and actually to certain areas within these states. The states most actively engaged in the commercial production of this fruit are New Jersey, Michigan, North Carolina, Massachusetts and Washington. However, there are other states, particularly along the eastern seaboard, where limited acreage has been planted. In 1943 the estimated value of the cultivated crop was $1,525,000, with an additional $1,000,000 to $1,500,000 from wild plants receiving very little care. The value of the cultivated crop has increased considerably since that time and rather rapid commercial expansion is still under way.

Even though the blueberry does not thrive on the average garden soil without special care, it is finding its way into many home plantings. This is true because of its ornamental as well as fruit value. The plants have a special appeal to many persons for landscape use as individual bushes, mass plantings, or in hedges. The bare reddish-green twig color during the winter months, the very attractive white blossoms in the spring, the dark green foliage of summer, and the various shades of red leaf color in the autumn are all very pleasing to the eye. Perhaps the most discouraging fact is that the ripening fruit has to be protected from the birds with some type of netting, such as cheesecloth, tobacco cloth, or green plastic netting.

The highbush blueberry grows naturally where the soil is acid and moist, and similar conditions must be furnished in the home garden if it is to produce satisfactorily. A loose open soil, such as azaleas and laurel enjoy, will grow blueberries. In dry periods, water must be provided or the plants will suffer severely and may even die.

Strange as it may seem, even though the highbush blueberry is a native of swamps and moist lands and needs ample moisture during the growing season, the garden soil must be well drained. A water table a foot to a foot and a half below the surface is desirable, but the lack of such a water table can be supplemented with mulch.

The blueberry is a very shallow-rooted bush, so cultivation must be shallow. In fact, in recent years, experiments have been conducted to study the effects of mulching the blueberry with leaves, straw, sawdust, etc., to avoid cultivation and the consequent root disturbances, as well as to keep the soil cool, to retain moisture and to control weeds. One of the illustrations shows a patch of blueberries heavily mulched at the New Jersey Experiment Station. When mulching is practiced, heavier applications of nitrogen must be made, until the mulch begins to decay considerably.

Blueberry plants may be obtained from nurseries in spring or fall, for they transplant readily in March and

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How Old Are The Manchurian Lotus Seeds?

By Ralph W. Chaney

Old age is considered an asset in the Far East. When — a few years ago — I was crossing the rugged terrain of central China to study the surviving trees of *Metasequoia* in hidden valleys of Szechuan, magistrates with whom I conferred along the way often told me I was an active man for my age — that I should live to be a hundred years old. Their implied suggestions that I might become a centenarian in a year or so was no discourtesy; it was their way of paying respect to the pale-skinned stranger who appeared so unexpectedly on their village streets.

Desire for earthly immortality is implied in such legends as the search by Ponce de Leon for the fountain of youth. The idea of suspended activity is expressed in stories of the Sleeping Beauty and Rip Van Winkle; perhaps this idea has had its origin in the ability of certain seeds to remain viable, that is alive, for many years without showing any sign of life, and later to grow and reproduce when favorable circumstances arose. For there are many legends regarding the viability of seeds over long periods of time, all of them open to grave question as in the case of the grains of wheat from the Pyramids.

Now comes the strange story of lotus seeds from a Pleistocene lake deposit in Manchuria, seeds which grow readily and produce strong plants after a period of inactivity to be measured in tens of thousands of years. The question may fairly be asked whether this is merely another legend, or whether it constitutes the longest known record of viability. Are the lotus plants which have recently been germinated at our National Capital the oldest living things?

The geologist has an answer for this question, based upon the sequence of events which is recorded by the rocks and topography in the Pulantien Basin of southern Manchuria where the seeds were discovered. In listing these events we may start with the oldest, following the practice of the geologist:

(1) In a lake basin about a mile across, there accumulated a layer of plant fragments—leaves, stems, roots, which were largely disintegrated to form a deposit known as peat. In this debris were buried, as they ripened and fell from the parent plants, thousands of seeds of a water-lily similar to the Indian lotus, *Nelumbo nucifera* Gaertner. Because of their thick walls, few if any of these seeds germinated; natural propagation was mostly limited to sprouting from the tuberous roots, judging from the mode of reproduction of similar living plants. While the rate of accumulation of peat may vary somewhat, geologists estimate that it normally requires many years for plant fragments to accumulate and become compacted to form even an inch of peat; so it may be supposed that lotuses lived in this Manchurian lake and dropped their seeds and other structures to its bottom over a period of several centuries.

(2) At some later time the lake was drained, and the layer of peat was exposed to the atmosphere. Dust from the Gobi Desert and from other arid areas to the north was deposited on the lake beds, and the lotus seeds buried in them were further covered by several feet of a fine wind-borne clay known as loess. There is no further record of the existence of lotus plants in this area. Without a visit to Manchuria, which under present world conditions would be difficult, it is impossible to determine why and how the lake disappeared. But from observations of my own and of others in this part of the world, it is reasonable to suggest that the coastal plain on which it lay was uplifted, making it possible for a river to erode back until its valley cut below the level of the lake basin.

(3) This suggestion is supported by the present course of the Pulantien River, for it has cut down through the layer of loess at the surface, through the underlying layer of peat, and to a depth of more than forty feet into the bedrock below. The peat bed, now exposed on the valley walls, is all that remains to tell us of the lake which occupied the Pulantien Basin in times past.

It scarcely requires geological training to realize that this series of events must have extended over a great period of time as measured by human standards. Accumulation of the peat in which the lotus seeds are embedded, probable uplift of the region several tens of feet, deposition of the loess, cutting of a valley forty feet deep, all this involves time to be measured not in decades or centuries, but in thousands of years. There is no possibility that the seeds were later introduced into the peat bed through gopher holes or some other openings from the surface, for they are far too abundant. I am told by Dr. Seido Endo, who is a professor of geology and paleontology at Tohuko University in Sendai, that the loess deposits overlying the layer of peat are of Pleistocene age; this same authority on the history of the earth in northeastern Asia believes that the peat was deposited fifty thousand years ago, together with the seeds contained in it. Probably most geologists would agree that these events in earth history — draining of the lake, deposition of the loess, and cutting of the valley — must have required time to be measured in tens of thousands of years. In fact, I doubt that any geologist would even question the Pleistocene age of the peat layer, if it were

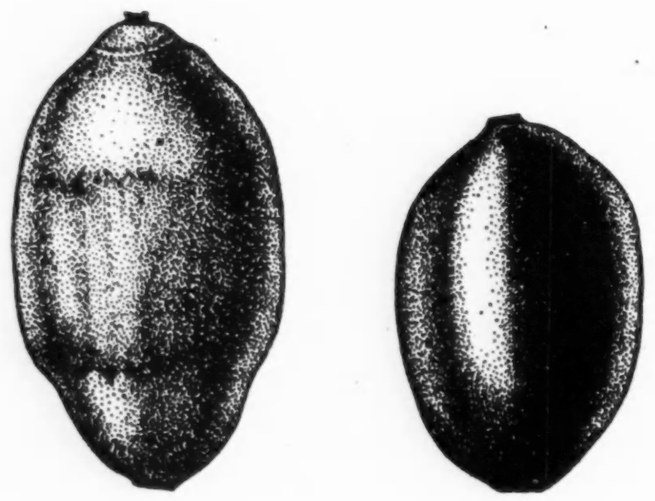
not for the fact that it contains lotus seeds with living embryos.

There is another wholly independent line of evidence involving distribution which suggests great antiquity for the lotus seeds of Manchuria. For this plant is no longer a native of northeastern Asia, though it has been widely introduced into China and Japan where its roots and seeds are a regular item of diet. Its present range does not carry it farther north than southern China, fully a thousand miles to the south. Unless the Pulantien seeds come from plants brought in by man within the past few centuries, we must assume that the natural occurrence of the lotus has been restricted far to the south since the time our seeds accumulated at the bottom of the lake. Similar changes in distribution of plants during and since the Pleistocene epoch, commonly called the Ice Age, have been noted in North America where many trees are known to have shifted their area of occurrence for hundreds of miles as a result of the climatic changes brought about by glaciation.

A third factor may be considered, which appears effectively to dispose of the possibility that man may have brought to Manchuria the lotus plants which produced our seeds. This is the actual difference between the seeds of Pulantien and those of the modern Indian lotus. Drawings of these seeds show that the former are somewhat smaller and more elongate, and they lack the protuberance representing the base of the style which is found on modern seeds. These and other minor differences seem to indicate a lapse of time during which the seeds of the lotus have undergone evolutionary change.

The combined botanical, geographic and geologic evidence is therefore in agreement, indicating great antiquity for the lotus seeds which were germinated in Washington and in Berkeley, California, last March. A brief account of their discovery and early study, and of my part in their history of the past few months may here be given. Although there had been previous reports, the first statement regarding their occurrence which I have seen was in 1923 by the Japanese botanist, Ichiro Ohga. Later he studied in the United States at The Johns Hopkins University and at Boyce Thompson Institute, and wrote a series of papers describing their structure and germination. Being a botanist, Dr. Ohga was not sufficiently impressed with the antiquity of the seeds as indicated by their geologic occurrence, and he estimated their probable age as "at least three or four hundred years". On the completion of his studies, he gave seeds to various institutions in Japan and the United States.

During my visit to Sendai in the summer of 1950, I saw some in the paleobotanical collections at Tohuko University, and Dr. Endo was kind enough to give three of them to me. How long they had been in his laboratory I do not know, and the prospect of their germinating after many hot



The Pulantien lotus seed (right) is somewhat smaller and more elongated than the modern Indian lotus seed (left) and lacks the protuberance representing the base of the style.

summers and cold winters seemed remote. However, I brought them back to President Vannevar Bush of the Carnegie Institution of Washington, who had previously expressed an interest in the antiquity of seeds from the frozen muck of Alaska. At his suggestion, two of them were turned over last November to Edward J. Kelly, Superintendent of the Capital National Parks; the third I brought back to Berkeley to show to my students at the University of California. Mr. Kelly placed his seeds in the custody of the plant pathologist at Kenilworth Aquatic Gardens, Horace V. Wester.

My next word regarding them came in March, when a reporter from the Washington Post phoned me in Berkeley to tell me that the seeds had germinated, and to ask my basis for telling Superintendent Kelly that they were tens of thousands of years old. An account of Dr. Wester's procedure in germinating these seeds has been published in the "Bulletin of the Garden Club of America" for May 1951, together with my comments as to their age. With lotus seeds sprouting in the National Capital, it seemed only proper to give my remaining seed a chance to demonstrate its viability in California. Under the care of Senior Nurseryman Harry K. Roberts of the University's Botanical Garden, this seed was soaked in concentrated sulphuric acid for three hours, then thoroughly washed and placed in a beaker of water; within an hour cracks began to appear on its shell as entering water caused the embryo to expand; less than two days later, a green shoot appeared and rapidly elongated. So far we had equalled the success of Dr. Wester, who employed the method of filing the seed coats as outlined by Ohga. But events of the next few days were disappointing. As the cotyledon of our seed opened out, it broke off and became infected with fungus; within a few days it showed no further sign of life. However, the Washington seedlings have continued to thrive. When Dr. Wester showed them to me at the Kenilworth Aquatic Gardens in April, placed in pots and submerged in a basin in the greenhouse, they had leaves nearly four inches across, with petioles a foot long. Suggestion of the color of their flowers is seen in the pinkness of the veins on the under side of the leaves, but we shall have to wait for several years before these lotus plants come into bloom.

In the meantime, there is the important matter of their age to consider. Biologists are naturally skeptical about an age estimate of tens of thousands of years. Rumors of antiquity involving several thousand years, in the case of wheat from Egypt, have been shown to be incorrect. Several tests have been carried on with seeds placed in containers beneath the surface; of these Beal's experiment was begun in 1879 with twenty kinds of seeds, mostly of common weeds, only ten of which germinated forty years later. Duval's experiment with one hundred seven kinds of buried seeds showed that oats, wheat, corn, bean, melon, and onion did not germinate after one year, and that not more than thirty-six species, including tobacco and locust, were viable

after thirty-nine years. Molisch believes that only seeds with thick shells, making them impervious to water and air, may survive as long as fifty to eighty years; he mentions that wheat, oats and other thin-shelled seeds may show a high percentage of germination at the end of ten years, if they have been wrapped in paper and held under relatively dry conditions.

Ohga cites a modern lotus seed which germinated after an interval of more than one hundred fifty years. To my knowledge this is the oldest record, and it is significant that a lotus seed is involved, for it has a shell with a thickness comparable to that of the Manchurian seeds. And it is this thick shell which appears to be responsible both for delaying germination (the Manchurian seeds have been soaked in water for twenty months without showing any signs of growth), and for the retention of life in the embryo within. Who can say that with such a protective covering any seed might not retain its viability indefinitely? This is a question for a biologist rather than a paleontologist to answer.

But the question of the age of seeds brought to our attention by Dr. Ohga may eventually be solved by a chemist. All living matter contains an isotope of carbon known as Carbon-14. Dr. W. F. Libby of the University of Chicago has learned that this substance is gradually dissipated, and that at the end of 20,000 years no trace of it can be found; since its loss is at a constant rate, he has been able to develop a method of dating which is based upon the amount of Carbon-14 which remains in the material whose age is to be determined. To apply this method it is necessary to have an amount equal in this case to twenty lotus seeds. There are doubtless thousands of lotus seeds still left in the peat bed at Pulantien, but there seems to be no way to get them out of Red China. However the case is not hopeless; at the National Museum, Dr. Roland W. Brown recently showed me four of the seeds which were deposited there by Ohga twenty-five years ago, and generously turned over two of them to me. At The New York Botanical Garden, I found four more in a tray where they had lain unnoticed for years. Search at Boyce Thompson Institute, where Ohga studied while in the United States, produced no seeds. But I have hopes that some may be found at The Johns Hopkins University and at other institutions in America. And a recent letter from Dr. Endo indicates that he is sending me several seeds from his collection at Sendai. Perhaps the question now only tentatively answered by the geologist may soon be resolved by Dr. Libby. Only then shall we be able to say with assurance that these are fossil seeds, representing the greatest known prolongation of life from remote antiquity.

This would be life from the same epoch as that in which our oldest human ancestor, Peking Man, lived in a cave in the Western Hills, and dragged to his hearth, to provide food for Peking Woman and the Peking Children, the carcasses of deer, gazelle, rhinoceros, and other animals either extinct or no longer living in North China. It would be interesting to know whether this First Family (anthropologically) of China ever admired the flowers of our Pleistocene lotus, if Pleistocene it proves to be, and whether its roots and seeds were used for food in this oldest known human home. We have more questions than answers as we study the thick-shelled seeds from the peat bed at Pulantien.

Footnote: — "Preliminary tests by Dr. W. F. Libby, based upon the amount of residual Carbon-14, indicate that the seeds have a minimum age of 1,000 years. It is hoped that more seeds can be secured so that a test can be run using only their shells, and that some of the peat in which they were buried may also be tested. With this additional information, the maximum age of the seeds from Pulantien may be established." Dr. Chaney.

REMARKS —

on the Alpine Conference and Irish Gardens

By Helen M. Fox

My purpose in going to the International Alpine Conference, held in London and Edinburgh, was to learn about plants new to me, to see how they are grown, and to meet some of the great gardeners, for the gardeners of Great Britain stand at the top of their profession.

On the whole, alpine gardeners are collectors of rare plants and aim to grow as many different species and varieties as possible—they do not curb variety in order to achieve a harmonious effect. Alpine gardening is well suited to present-day conditions for it permits the gardener to have an extensive collection of plants in small space.

In connection with the first session of the Alpine Conference which took place in London at the Royal Horticultural Society's buildings, there was a flower show entirely of alpine plants, a few miniature gardens and hundreds of plants in "pans". All the plants were well grown and in perfect condition. Sometimes an alpine garden devotee would have come with two or more pans carried by hand, on a day's journey, which necessitated several changes of trains and buses. Again, an exhibit would have been put on by a professional gardener.

It is striking to see how many nurserymen in Great Britain specialize in rare plants in comparison with the few who do so here. However, it is not really surprising in view of the interest in rare plants over there. At the show were fine saxifrages, some of them horticultural varieties, but I noted *Wernlocki* and *media*. There were many ericas, notably Springwood White, and heathers, androsaces, dryas (among them *D. octopetala*), species tulips galore and species daffodils, *Cyclamen neapolitanum,* and

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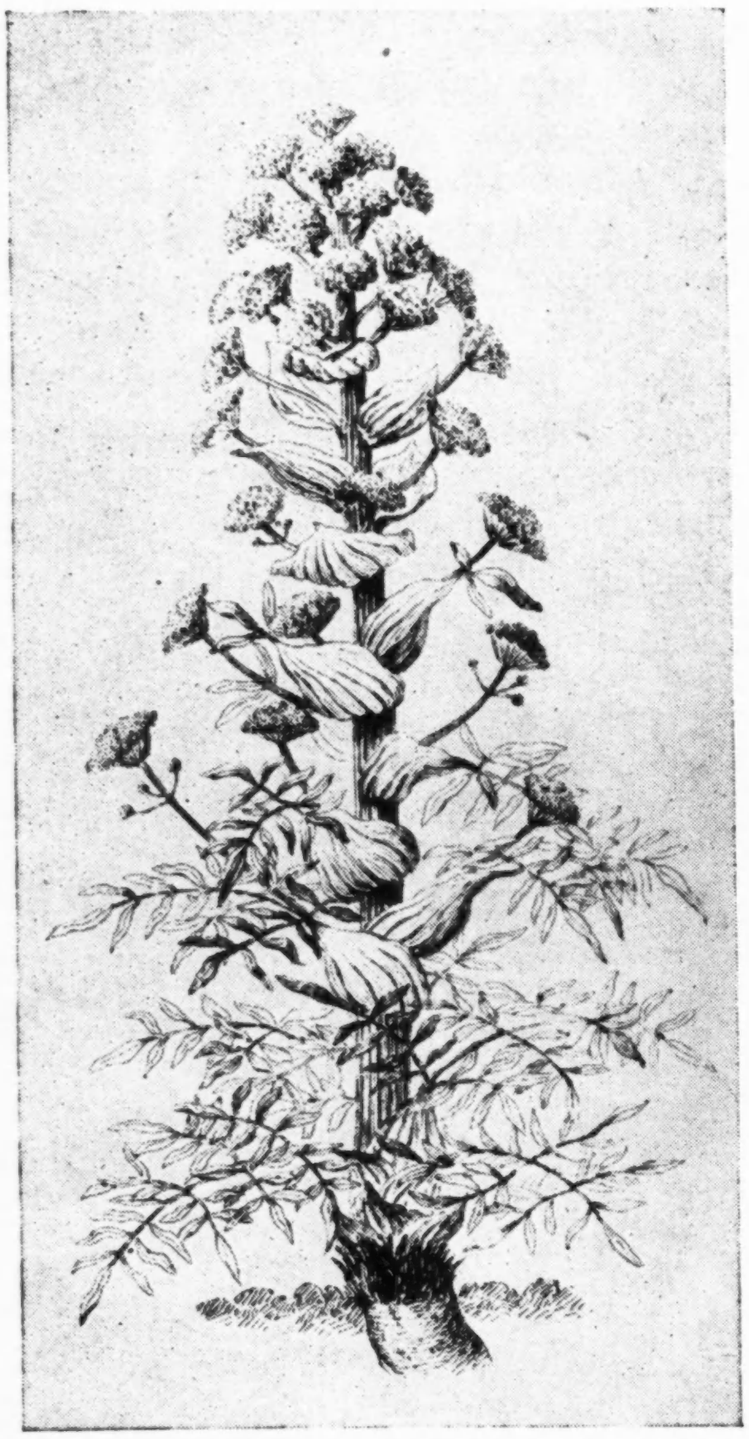
THE MYSTERIOUS SILPHIUM

By Harold N. and Alma L. Moldenke

In the Mediterranean shores of northeastern Africa lies the section of land known as Cyrenaica, with an area that has varied from 75,340 to 230,000 square miles (the larger area being that of the modern province) and with a present population of 225,000 to 250,000 inhabitants. It is now part of the United Nations trusteeship territory of Libia, lying between the Libian Desert on the east and Tunisia and the Sahara Desert on the west. Between its capital city, Bengasi (at the western end of Cyrenaica) and Tobruch (at the eastern end) lies the site of the ancient city of Cyrene (Cirene). This was one of the five large cities that gave to the region the name of "Pentapolis" in ancient times. Cyrene fell into final ruins in Mohammedan times and its site is now marked by the village of Grenne (Ghrennah or Kurin).

The Berbers appear to have been the original inhabitants of the area. They were gradually pushed back from the fertile coastal strip into the barren mountains of the south by various foreign invaders, the first of which were the Therian Greeks who, in 631 B. C., under Battus, "the stammerer" (or Aristoteles, as he is sometimes called), founded the city of Cyrene. It was located on the Jebel Akhdar highland at an altitude of 1,800 feet, seventeen miles back of the coast.

Battus, who had been instructed by the Delphic oracle to found a colony in "a place between waters", had first made an unsuccessful attempt on an off-shore island. He had then been led by the friendly natives to this mainland site where the many springs satisfied the Delphic requirement of "a place between waters". There is no large permanent river in all of Libia. The colony was named for Cyrene, a Thessalian nymph, said to have been carried to northern Africa by Apollo. She became the mother of Aristaeus,



Drawing of silphium plant from the book, *Zur Silphionfrage*, by Elsa Strantze.

a demigod whose chief activity was the protection of men, domestic animals, and cultivated crops from the heat of the dog-days. Cyrene became a guardian spirit of the springs of water on which the life of the colony depended.

The fertility and richness of Cyrenaica in these early times were beyond compare, causing this part of the world to become "the granary of Rome and Greece". In 330 B.C., for instance, when most of the big cities of Greece were stricken by a great famine, Cyrenaica exported no less than 29,000 tons of wheat to them. Somewhat before this time, the rulers of Cyrene sent emissaries to Plato, the greatest philosophic thinker of the age, inviting him to examine and, if necessary, redraft Cyrene's entire legal code. This Plato politely declined to do on the ground that Cyrene was obviously too wealthy a city to pay any attention to what he would have to propose.

So rich was the area that the city of Bengasi was originally called Euesperides—an obvious allusion to the mystic garden of the Hesperides or daughters of Hesperus, the evening star. In this garden was supposed to grow the tree bearing the "golden apples" which Earth presented to Hera (Juno), supreme goddess of the heavens, on her marriage to Zeus (Jove). One of the "labors" of Hercules consisted in obtaining some of these apples. On an ancient coin of Cyrenaica, Hercules is shown receiving them from one of the Hesperides or, perhaps, from Cyrene herself. The choice of this name for the city lends further credence to the supposition that the Bengasi plain was then so immensely rich as to suggest the site of this fabulous garden. Some authorities have even thought that these "apples" were symbolic representations of the silphium plant depicted on the obverse side of the same coin.

Cyrene reached the height of its prosperity under its own kings in the fifth century B. C. Soon after 460 B. C., it became a republic. It passed over to Egyptian rule in 321 B.C., after the death of Alexander. About 300 B.C., Ptolemy I sent large numbers of Jews there as settlers and this element of the population increased rapidly. Several Cyrenian Jews are famous in history; among them are Jason of Cyrene, whose work is the source of the Second Book of Maccabees, and Simon of Cyrene who carried Jesus' cross from Jerusalem to Golgotha. At the time of Sulla (about 85 B.C.) the inhabitants of Cyrene were divided into four classes: citizens, farmers, resident aliens, and Jews.

The last of the Egyptian kings, Ptolemy Apion, bequeathed Cyrene to the Romans. In 74 B.C., it was made a Roman province, but with considerable self-government. After the revolt of the Jews in Palestine against Roman oppression, a revolt that had been crushed in 70 A.D., sympathetic revolts broke out among the Jewish populations of Alexandria and Cyrene. A serious insurrection was suppressed by Marcius Turbo (115-117 A.D.) after the virtual destruction of the city and the massacre of some 200,000 Greeks and Romans. Such fighting so depopulated and impoverished Cyrene that a few years later entirely new colonies had to be established by Emperor Hadrian, a great admirer of Greek culture, who ordered the rebuilding of the city. For a time Cyrene became a flourishing seat of the early Christian church.

In the fifth century A.D., the Vandals poured in and conquered the area, again wreaking great destruction. They were followed by the Persians, and then, in 641 A.D., the Bedouin Arabs (or Saracens) of Mesopotamia overran the land, and Christianity was completely replaced by Mohammedanism. In the sixteenth century, the Turks took over. Finally, it was wrested from the Turks by the Italians in 1911-1912. During the Second World War, the Germans under Rommel and the British under Montgomery jockeyed back and forth over this historic ground.

We see, thus, from this brief outline of the history of the region that it has been one of considerable importance for many centuries. Tripolitania, the western part of Libia, colonized even earlier by the Carthaginians, owed its importance to the fact that most of the great caravan routes converged there. Cyrenaica, however, owed its wealth to the rich grain fields on the lowland coastal strip and the presence of a single species of wild plant known as "silphium". From the sixth to the fourteenth centuries B.C., most of the many coins of the city of Cyrene carried an embossed representation of this local plant on which the economy of this colony obviously depended.

This plant had nothing in common with the small group of North American yellow-flowered composites, to which Linnaeus much later in history (1753) applied the name *Silphium* and which includes our rosinweeds or rosinplants, the cup-plant, and the famous compass-plant or pilot-weed of the western part of North America. The north African plant was obviously a member of the carrot family, possessing tightly capitate umbels of tiny flowers on rather short peduncles in the axils of broadly sheathing leaves, the uppermost of which were apparently almost opposite on the stem and reduced to about three very narrow leaflets borne at the apex of the large conspicuous sheath.

The very large, perennial, woody roots and strongly ribbed annual stems of the silphium plant were eaten in the fresh state with vinegar and were regarded as a perfume, flavoring agent, spice, and condiment. The juice was employed medicinally against muscular spasms, tremors, backward spine contortions, epilepsy, melancholia, hysterical loss of speech, inhalatory asthma, coughs, bronchial conditions in the aged, to facilitate menstruation, and for many other gynecological ailments; as a vermifuge; for many veterinary uses; as a blood and milk coagulent in colic; and even as an antidote against poisons and against insect and reptile bites. These many properties naturally caused the plant to be in such demand that, according to Pliny, the Roman naturalist, it had already become virtually extinct at the time of Christ. Its herbage even provided a valuable cattle feed.

The silphium plant is mentioned again and again in classical literature (by Pliny, Hippocrates, Dioscorides, Herodotus, Theophrastus), so we know quite well where it grew, what it looked like, for what it was used, how it was harvested, and how it became exterminated. On close to a hundred different coins of Cyrenaica, we see representations of the terminal portion of the plant or of its fruit. These are so clear and uniform that the plant would easily be recognizable, yet botanists have searched in vain through Libia for it. It seems truly to have been completely wiped out—like the dodo, great auk, and passenger pigeon — another casualty to the in-

From the sixth to the fourteenth centuries, B.C., many of the coins of the city of Cyrene carried an embossed representation of the silphium plant.

satiable greed of man. It occurs on nearly all the coins from about 570 to 250 B.C. Then it begins to disappear, and its absence from the coins becomes increasingly conspicuous in the Egyptian and Roman periods, probably in direct consequence to the progressive extermination of the plant.

As far as we are able to ascertain, the plant was found only in the dry hinterland between Bengasi and Derna. Attempts to cultivate it seem to have failed, so wild plants remained the main source of supply. As demand for silphium was great and the supply very limited, high prices were demanded and were received. In harvesting it, deep incisions were made into the stalk and root or, as in later times, the crown of the plant was entirely cut off. When the resin, which oozed from the cut surface of the underground stem and root, solidified, it was gathered and formed the commercial product. This method of harvesting is identical with the classic method used in gathering asafetida in Persia and Afghanistan, and the descriptions and representations of the Libian plants agree well with those of *Ferula asafoetida* and certain related species such as *F. narthex* from Balthistan, *F. foetida* from Turkestan, and *F. tingitana* from Syria and the western portion of north Africa. Theophrastus compares it with what he called "ferula" and "magydaris", now known to be *Ferula communis* and *Prangos ferulacea,* respectively. Silphium was certainly a species of *Ferula,* but probably not any one of the above-mentioned. After its extermination, the asafetida plant became a substitute for silphium, and trade with the Near East supplanted that with Cyrene.

To most occidentals, the odor of asafetida is nauseating and disgusting, but to orientals it is apparently attractive. In Persia asafetida is still used to flavor sauces and curries, as a drug, and as a perfume. We use it, too, in perfumery, but only when very dilute. In medicine it has been employed in the treatment of nervous disorders like hysteria, for asthma, chronic coughs, and digestive disturbances such as flatulence and constipation. Veterinarians still use it extensively.

For about five centuries, the resident rulers of Cyrene enforced strict and far-sighted controls over the silphium crop in a very wise and successful effort to conserve this most valuable export. By restricting the output, they ensured a steady supply for the future of the colony and maintained a high price. The methods of gathering were carefully defined so as not permanently to injure the plant, and the amount that could be harvested was stringently regulated each season. Evidence indicates that these measures resulted in so steady and dependable a price for dried silphium resin that the latter became recognized in Greece and Rome as a permanent source of wealth. It was actually stored in the Roman state treasury.

However, under the Roman republic Cyrene did not fare so well. In 34 B. C., Antony turned the province over to Selene, his daughter by Cleopatra, and re-named it Cleopatris. Under the new status Cyrenaica was ruled not by permanent local residents, who had the future of the colony at heart, but by a series of short-term governors, who apparently thought only of reaping the maximum possible profit during their brief terms of office. The tributes demanded by their tax-gatherers became so excessive that the careful regulations regarding the harvesting of silphium had to be laid aside. The farmers were forced to cut down more and more of the plants and to cut them wastefully. The silphium plant, thus mistreated, became scarce. It had to be searched for in more and more remote and inaccessible places, and finally it became extinct. The last record of the plant is that of Synesius, who knew it, though in a cultivated state only, early in the fifth century A. D.

After the republic was overthrown, Emperor Augustus tried to rectify some of these catastrophic abuses, but the extermination of the colony's only source of wealth had its inevitable effect. Cyrene was doomed. She soon ceased to be the capital of the country — was supplanted, in fact, by her former port of Apollinia. The neoplatonist philosopher, Synesius, describes in his letters, written at the beginning of the fifth century A. D., the ruin caused by a series of earthquakes that destroyed the magnificent temples, statues, and baths; the plagues of locusts that destroyed what was left of crops; the native raids that decimated the population; and the cruel oppression of the Byzantine governor, Andronicos of Bernice. Cyrene as an important city and colony died and was forgotten even before the several waves of Moslem invaders overran the country in 644 A. D. But she had lived a successful and eventful life from about 631 B. C. to about the same date A. D. — a 1300-year civilization which was established and maintained almost entirely through the presence of a single species of wild plant, the mysterious silphium — a civilization which flourished as long as the harvesting of this plant was carefully controlled and which died and was forgotten when thoughtless exploitation by greedy men, thinking only of the present, destroyed the plant on which its life depended.

As we look today upon our rapidly expanding civilization, our cities spreading their tentacles farther and farther into the countrysides, thousands upon thousands of acres of tropical forest being cleared in Africa for the growing of crops which are later decimated by virus diseases; the vegetation and animal life on thousands upon thousands of hectares of forest being destroyed in tropical America to be replaced by the ubiquitous eucalyptus, with the lamentable changes in ecology which this produces; the hundreds of thousands of acres of our own forests being cut down for lumber and pulp or destroyed by forest fires; the erosion of our fertile topsoil bringing dust-bowls and deserts where once were rolling prairies; the extermination of species after species of the native vegetation wherever man sets his foot, we may well wonder—is there not a powerful object lesson for us in this story of Cyrene?

Figures in the fields against the sky!
Two slow oxen plow
On a hillside early in autumn
And between the black heads bent down
Under the weight of the yoke,
Hangs and sways a basket of reeds,
A child's cradle;
And behind the yoke stride
A man who leans towards the earth
And a woman who, into the open furrows,
Throws the seed.

Antonio Machado

Observations —

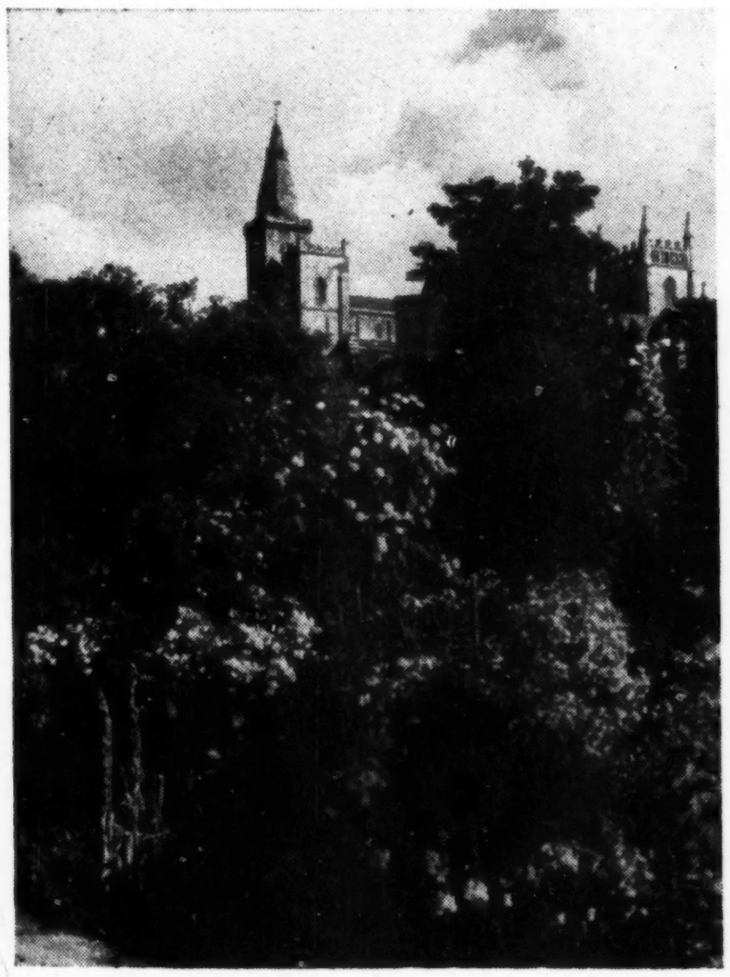
On Some British Botanical Gardens

By David D. Keck

ONE of the greatest collections of living plants in the world is to be found in the Royal Botanic Garden in Edinburgh. Dating back to 1670, the Garden ranks next to that of Oxford as the oldest in Great Britain. When the Garden was moved in 1823 to its present site, the ingenuity of the Scottish gardeners was equal to the task of transferring even the largest of the trees to the new location. One great yew, now a showpiece, was probably first planted some two hundred fifty years ago by James Sutherland, the Garden's first Regius Keeper.

Since its establishment on the beautiful sixty-acre site in the midst of the city, the Garden has striven to maintain in cultivation as many of the kinds of plants that can be grown in Edinburgh as possible—a broad objective indeed! The visitor from almost any part of the northern hemisphere will find thriving here numbers of plants that are familiar to him in his native land, and many that he recognizes as true rarities, or as species very difficult to grow.

The wild garden in Pittencrief Park, a true beauty spot through which runs historical Pittencrief Glen.

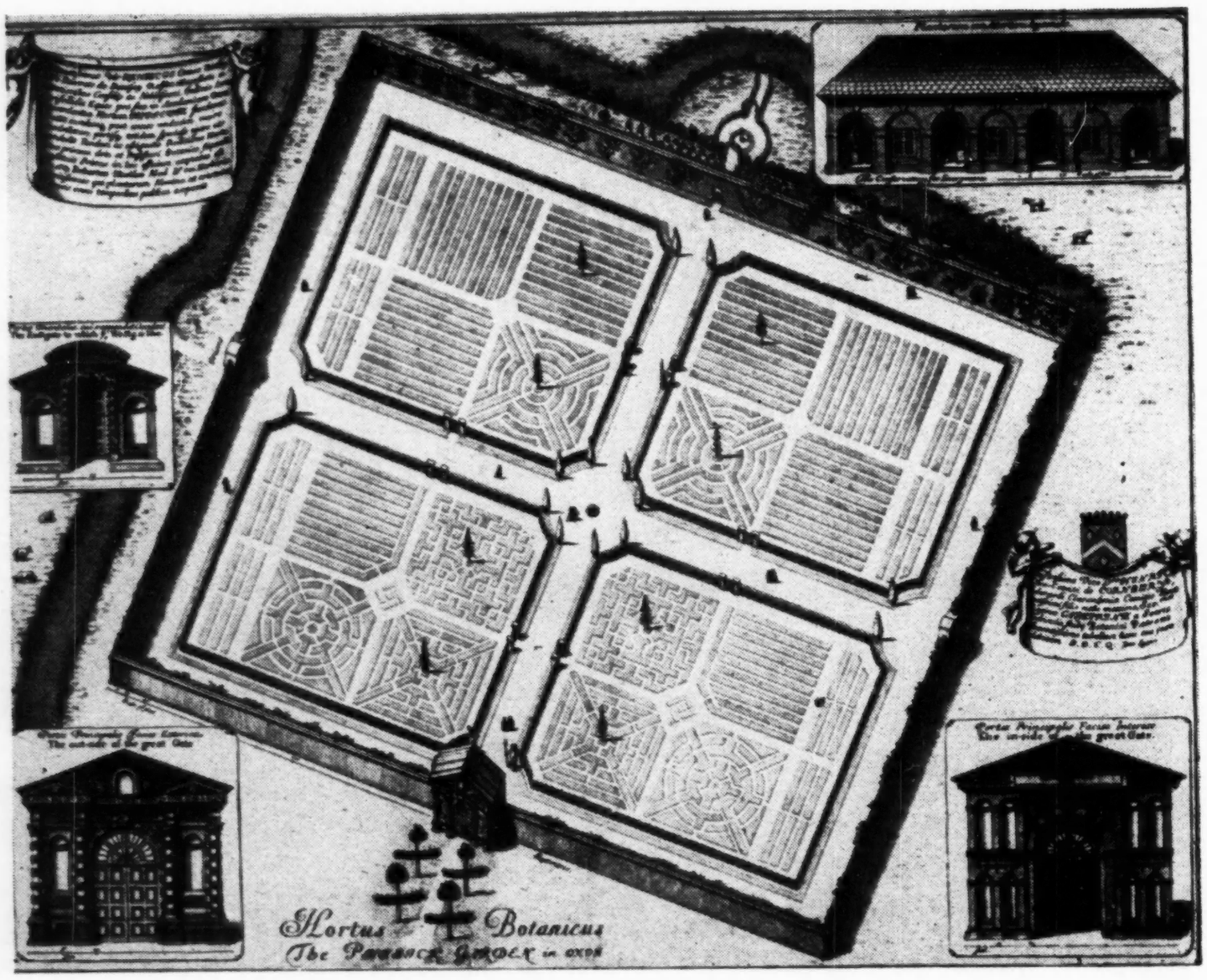


Dunfermline Abbey, where many members of Scotch royalty are buried, is visible from Pittencrief Park.

Although Edinburgh is as far north as central Labrador, it benefits from the Gulf Stream's unceasing delivery of a mild, moist climate. Edinburgh is, in fact, so located that many plants prove to be hardy here which are winter-killed at Kew, more than four degrees farther south. I was pleased to find the tenderest alpines, together with many strictly Mediterranean types, prospering in this garden.

The planners of the Edinburgh Garden have assisted Nature to obtain this result by their meticulous provision of local habitats congenial to specific plants. The rock garden, one of the world's largest, represents a considerable engineering achievement in itself. The impression is of a rugged mountainside broken by ravines. Narrow winding paths draw the visitor into positions for close-range observation of the alpines assembled from both hemispheres and to high vantage points from which he can survey not only the rockery but the skyline of Edinburgh. From here also he looks down into a deep ravine at a miniature bog garden. Very large rocks have been brought in to obtain these effects, and the plantings are so arranged that many fine plants can be viewed at eye level.

The rock garden's contours are softened by a well-planned use of dwarf conifers and dwarf evergreen shrubs. Especially noteworthy are the dwarf rhododendrons, which provide a continuous succession of bloom from January, when *R. parvifolium* is in full flower, through September or so. The peak of flowering of these plants, which are represented in the rockery by a number of species and in the Garden as a whole by a collection that is perhaps unique, is reached in early summer. The smaller heathers, rock roses, barberries, and genistas made bright pockets of color during my visit. The heathers are vanguards from the large scale plantings of heaths and their relatives in the heath garden,



Loggan's plan (1675) of the Oxford Botanic Garden shows the first lay-out divided into quarters by hedges. In the corners of the plan are elevations of gateways and conservatories.

into which the rock garden merges.

The herbaceous perennials of the rock garden are represented in remarkable variety. Primulas (which have been a special feature of the Edinburgh Garden for years, together with such other Himalayan and Chinese specialties as the lilies, gentians, *Meconopsis* and *Nomocharis*) occupy many nooks in the rock garden, too. All the sections of *Saxifraga* are very well represented, and the campanulas, phloxes, sedums, androsaces and anemones are prominent. In springtime the warm niches among the rocks are decorated with bulbous plants in wide variety.

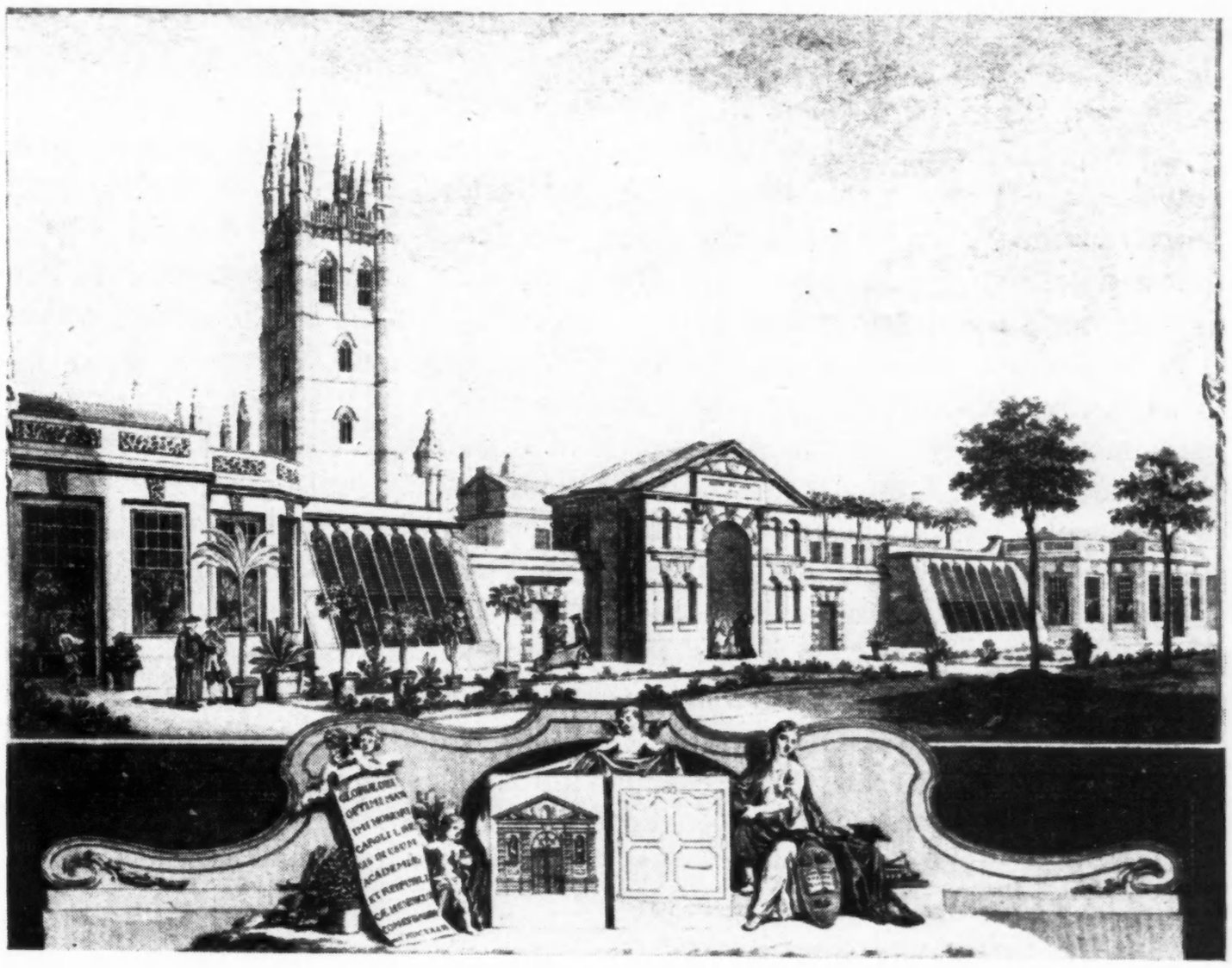
An elaborate scree has been built on a slight slope to one side of the rock garden, practically without soil, of whinstone chips to a depth of a foot, with two feet of rubble underneath. The splendid drainage this provides suits a multitude of rare alpines that thrive thereon. All of the choice lewisias of our own Northwest are perfectly at home, and many a "greenthumber" will attest to the special handling required to succeed with these plants. This artificial moraine is covered with cushion-type saxifrages, dwarf androsaces and drabas, colorful gentians, and our own little-cultivated douglasias. I was interested to learn that this rock garden is open twelve months of the year and that at any season one might expect to find blooms in it.

The Royal Botanic Garden, Edinburgh, has many other wonderful features, of which I shall mention but three. The conservatories are both extensive and well stocked, and two of their houses interested me particularly, namely, the insectivorous house, where the sarracenias, *Darlingtonia* and other pitcher plants grow together with pinguiculas, droseras and *Dionaea,* and the rhododendron house, in which some of the tree forms have attained magnificent size.

The woodland garden is a natural wooded area with winding grass walks that are lined with choice rare shrubs at every turn. Interspersed are beds of Asiatic primroses, poppies and lilies and many fine specimen plants. But the peat wall garden especially attracted my attention. Here the substratum was prepared with blocks of black peat about a foot thick, and on this partially shaded slope a great many acid-loving plants find a congenial environment. Some are so small and delicate, even when mature, that one is amazed that they can receive the individual attention and careful labeling that they do.

Finally, mention should be made of the students' collection, which is set out in systematic order by principal plant families as an aid to instruction. Many other botanic gardens have such

The bamboo garden is situated in a sheltered hollow. Only the smaller bamboos are sufficiently hardy to grow outdoors at Kew.



The range of greenhouses of the Oxford Botanic Garden from a print of 1773. The orangery on the extreme right was erected about 1730 and now accommodates the library.

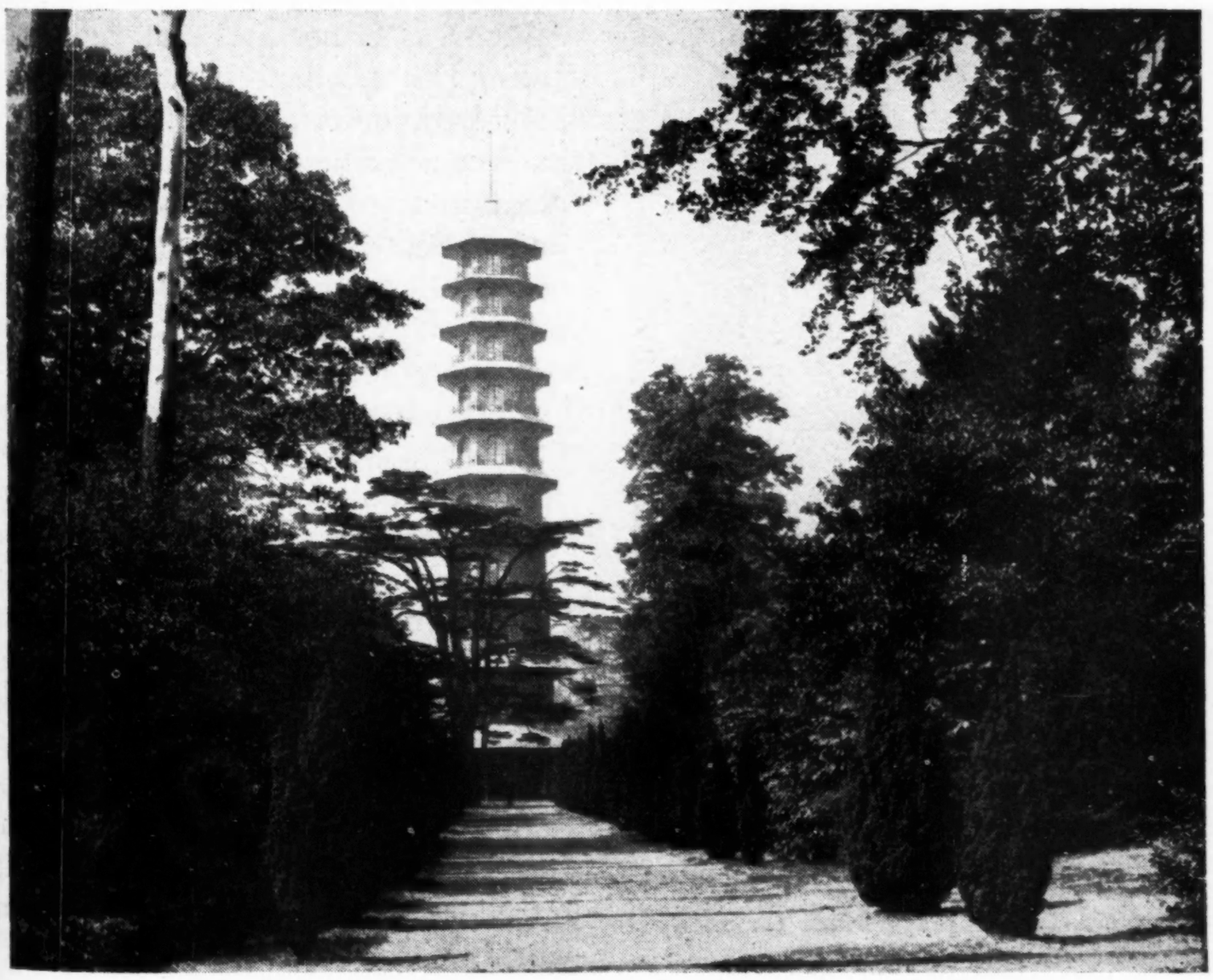
collections, almost wholly herbaceous and arranged in semi-formal beds, but here the appearance has been greatly improved by a careful inclusion of a certain number of woody types in their proper beds. Thus the arrangement becomes an attractive natural garden in appearance, although remaining strictly scientific in function. An outstanding shrub at the time of my visit was *Eucryphia glutinosa,* a Chilean relative of the roses now included in its own family, the Eucryphiaceae. Its abundant feathery white flowers are very attractive.

Quite a different garden is located not many miles northwest of Edinburgh, across the Firth of Forth, at Dunfermline. This is in Pittencrief Park, a true beauty spot through which runs Pittencrief Glen, a sharp ravine that bisects the city and that is rich with historical interest. Remains of two different palaces of the early Scottish kings are found in the Glen, as well as Dunfermline Abbey, in which many members of Scotch royalty lie buried. Andrew Carnegie, the great steel magnate, gave Pittencrief Park to Dunfermline, his birthplace, together with a trust fund to provide for its perpetuation. The setting, on an elevation with natural woodland and the deep glen, is ideal for the development of a garden with many diverse habitats. It does not pretend to be a botanic garden in the scientific sense, yet in the rockery, for instance, all the plants are labeled with their scientific names. This is in keeping with the European trend for the layman to use the scientific names of his plants much more commonly than the American does. European school children are often required to learn many score plants by their scientific names.

At Pittencrief Park the conservatories contained interesting things, but it was the trim appearance of the beds of herbaceous perennials that really caused the visitor to exclaim. The layout, bright but blended colorings, and excellent development and timing of the plants in these rather extensive semi-formal beds and borders offered as fine a show as I have seen, yet I was there in August, which I feel sure was late for the peak of the season.

And now we proceed to the Royal Botanic Gardens at Kew, out westerly from London. These Gardens are justly world famous, for they have so much to begin with and have utilized so well what they have! With the Thames River for one boundary, and a royal palace, a skyscraper Chinese pagoda, a bamboo garden, an artificial lake, and an herbarium and library which are the most extensive in existence within them, I have only begun to enumerate their features.

The conservatories at Kew are said



The pagoda was built at the Royal Botanic Gardens at Kew, at a time when the erection of Oriental structures was popular in Britain.

to house some 13,000 species and varieties. In addition to a temperate fern house and another for ferns from the moist tropics, there is also a house devoted to the filmy ferns, those most fragile plants whose fronds are so thin that a short exposure to even partially dry air curls them up irretrievably.

Kew attempts successfully to cater to as many public tastes as possible, with many purely horticultural features, such as the formal beds and the rose pergola, lying near more utilitarian collections of vegetable gardens, culinary herbs, a medicinal herb garden, and so on. Then there are the scientifically important collections in especially attractive displays, such as the aquatic garden, the extensive and well-planted rock garden, and the plants of the chalk downs. Here, too, should be mentioned the important collections of shrubs and trees arranged conveniently by relationships in the large arboretum. One can study by groups excellent selections of conifers, magnolias, barberries, azaleas and their relatives, chestnuts and maples, birches, many representatives of the rose family, such as cotoneasters, spiraeas, crab-apples, the pit fruits, and so on. The arboretum also contains many excellent specimen trees of oaks and other hardwoods, but *Cedrus atlantica* and *C. libani* are especially notable. Americans notice a large specimen of bald cypress growing in the edge of the lake in several feet of water.

The student collections, with the plants arranged purely botanically according to their relationships, make an extensive series of beds of herbaceous materials. The student of economical plants finds four buildings devoted to their display, with good collections of exotic timbers, and plants used for food, fiber, medicine and rubber.

Kew pioneered in the field of plant introduction, and throughout most of its history it has had a succession of able collectors engaged in botanical exploration. This policy soon resulted in building a uniquely rich collection, which grew in step with the spread of the British Empire, making Kew a truly international establishment. Its numerous laboratories and collections cannot be seen adequately during the course of only a few days' visit.

I saw other noteworthy gardens in England, such as those at Hampton Court Palace and some of the commercial seedsmen's plantations in the south, but space remains only to touch upon the interesting five acres that compose the Oxford University Botanic Garden. This garden, which lies on the banks of the River Cherwell, is the oldest in the British Isles, having been founded in 1621. It is still on the original site and retains its original stone wall that took ten years to build. About two-thirds of the Garden are enclosed by this wall. The first two plant houses, erected about 1730, were of the room or orangery type, and they still stand. One is incorporated into the building now housing the main laboratories of the Department of Botany. The other contains the library and is the ground floor of the building which houses the herbarium. From these buildings, which flank one side of the walled garden, one looks out upon the garden on one side and upon the Magdalen Tower of Magdalen College on the other.

From the midst of the Garden itself, I could see in the distance the characteristic towers of several other colleges of this widely spread university. Surrounding is the students' collection, with the plants systematically arranged by relationships in rectangular beds, and many fine specimen trees. Over the wall lie the range of nine greenhouses and a shrub garden of recent development. There, also, an interesting swamp collection has been made.

As we stand here, the wall shuts out the sounds of heavy traffic without and we are quite alone. We reflect that the ancient rain barrel of heaviest lead at the side of the old orangery was, perhaps, in service well before the Sibthorps, father and son, and John Jacob Dill (Dillenius) were penning their Latin descriptions of plants within. We are alone except for a host of plants that grow with abandon. Now in mid-September they do not seem to be coddled favorites groomed daily for public show, but rather a utilitarian collection that has been given good soil and freedom from competition and then left to grow. Of course, these fine roses have not resulted from such minimum attention, but the general impression is one of naturalness within the confines of a garden that has a rather formal plan. In the glow of autumn coloring, the Oxford Botanic Garden seems to me to speak out about the function of all such university botanic gardens through the past centuries: to offer to the enquirer a thrilling introduction to the plant life of our world.

The lake in the Royal Botanic Gardens at Kew provides a playground for many different kinds of wild fowl.

MYCORRHIZAL ASSOCIATION

Its Significance

By Donald P. Rogers

It is a commonplace of biological teaching that all green plants, because their chlorophyll permits them to synthesize their own food from carbon dioxide and water, are "independent." In contrast, those flowering plants and algae that lack chlorophyll, together with most bacteria and all fungi, are said to be, like animals, "dependent"—that is, ultimately dependent on green plants for food. There seems to be no question of the appropriateness of the second designation. But independence in biology is almost as rare and abnormal as in economic and political organization. Not only are many plants dependent on animals (such as bees) for pollination or on other animals (such as birds) for dispersal, but more important, many plants — perhaps the majority — are mycorrhizal and, therefore, dependent on fungi.

The word *mycorrhiza* means fungus root. It is given to a compound structure, formed by the intimate association of the root — or rather the young, active portion of the root —of a higher plant with the thread-like mycelium of a fungus. The closest analogue to such a structure is a lichen, which is an association of a fungus and a simple alga. In most mycorrhizae at least, the mycelium not only grows in the spaces between the cells of the root-tissue but also into the cells themselves, forming branched or coiled haustoria (absorbing organs) in contact with the living protoplasm. In many mycorrhizae the fungus forms, in addition, a compact felt-like sheath covering the surface of the rootlet and wholly separating it from contact with the soil.

Some mycorrhizae are little different in external appearance from roots of the same plant into which the fungus has not penetrated; but just as a lichen has a characteristic form quite different from either the fungus or the alga alone, so many mycorrhizae are quite different in morphology from non-mycorrhizal roots. Some are swollen and tuber-like; some consist of a series of smaller bead-like swellings; and the best-known are clusters of short coral-like branches, either lying in one plane or spread out in a bouquet, borne on the sides of long, little-branched, non-mycorrhizal roots. Frequently the mycorrhizal portion of a root is distinguishable by its color. Some of the most frequent forest mycorrhizae are pearly white and contrast conspicuously with the darker, uninvaded portions of the root. Others may be tawny, or jet-black, as the sheath of mycelium varies in color with the species of fungus present.

Mycorrhizae are easy to find. Almost any American tree growing in its normal habitat is mycorrhizal; and if one digs up the fine terminal root-branches in the nearest woodland, he is sure to come upon mycorrhizae. The three qualifications — "almost", "American", and "in its native habitat" are not meant to suggest any real limitation of the prevalence of mycorrhizae, but only to indicate that not all species of trees nor all regions have been adequately studied for the occurrence of mycorrhizae, and that it is possible. under special conditions, to grow trees without mycorrhizae. What would be difficult is to find a tree that is not mycorrhizal.

The same is true of orchids, or members of the Ericacea (rhododendrons, blueberries, heathers, Indian-pipe, and so on). It is so highly probable as to approach certainty that any plant of these families, whether wild or under cultivation, will be found to be mycorrhizal. Nor do mycorrhizae occur in only a few odd families. Of the many known species of plants only a relatively small number have been examined for mycorrhizae; and yet there are over seventy families of seed-plants known to have mycorrhizal members. All major groups of ferns and fern-allies have mycorrhizal species, and probably most ferns are mycorrhizal. And even some liverworts, which cannot be said to be mycorrhizal because they have no roots, form similar associations with fungi. Mycorrhizae occur in herbs, shrubs, and trees, in monocots and dicots, in prairie and forest and garden and orchard.

The great importance of mycorrhizae to vegetation has been obscured by two irrelevant considerations. The first is the doctrine of the root-hair. It is easy to sprinkle a pinch of radish seed over moistened filter-paper in a covered dish, to wait a few days for germination, and then triumphantly to demonstrate a fuzz of hairs on the seedling root. Each root-hair is an outgrowth of an epidermal cell and increases several-fold the exposed surface through which that cell can absorb food and minerals. Thus is shown the means by which plants take in from the soil the raw materials for their growth. Or is it? What is true of a radish seedling in a petri-dish is not inevitably true of an oak in the forest, or even an orchid in the greenhouse. If the number of plants known to be mycorrhizal is small in relation to the whole number of species, the number known to produce root-hairs in nature is also small. Although "never" is a strong word, it is probably true that many plants never bear root-hairs, and certainly true that their normal state is one in which mycorrhizae are developed and root-hairs are lacking. Since all of the absorptive surface of a pine or oak is covered by a felt of mycelium so that it cannot touch the soil, and no root-hairs are formed, an explanation of its manner of taking in water and dissolved materials cannot well be based on root-hairs.

The second obstacle to the proper evaluation of mycorrhizal function has been the demonstration, in garden or

Mycorrhizal roots from surface debris of a hemlock grove. The short laterals are thoroughly pervaded by a fungus.

laboratory, that plants known to be normally mycorrhizal can grow without the fungus associate. Thus it was shown that while orchid seeds ordinarily do not germinate, nor orchid plants grow, without a fungus, seeds planted on a medium of properly balanced salts and special sugars solidified with agar and maintained in sterile laboratory glassware will germinate and the seedlings thrive. From this it has been concluded that orchids do not need mycorrhiza. No doubt this is quite true — as true as that tomatoes do not need soil, rain, or sunshine. It may even be important. Similarly, oaks will grow in pots, and probably in good garden soil, in the absence of a fungus associate. But that is not in fact the way oaks do grow in the forest, or tomatoes in the garden, or orchids in the greenhouse. Tomatoes in the garden need soil, rain and sunshine — and oaks and orchids need mycorrhizae.

Undoubtedly the strongest evidence for the importance of mycorrhizae comes from some of the flowering plants inappropriately called saprophytes. These are humus-inhabiting plants that do not possess chlorophyll and are demonstrably not root-parasites on other plants. Indian-pipe (*Monotropa*) and pine-sap among the Ericaceae and *Corallorhiza* among the Orchidaceae are good examples. It has been widely believed that such plants derived not only water and minerals but also their supply of carbohydrates from the soil — by implication from the disintegration of the vegetable debris in it (saprophyte = decay plant). Actually, there is no evidence that the roots of any flowering plant can produce decay in humus and, in consequence, "saprophyte" is not only a misnomer but wholly misleading as an indication of the biological status of such plants.

Monotropa, to take a clear example, has no extensive fibrous root-system; what roots it has are gnarled, much reduced, and compacted into a small, dense, tuber-like mass, with insufficient surface to absorb even enough water for the plant. In addition, the surface of the root-mass is completely enclosed by a felt of mycelium and is not in contact with the soil. Whatever the plant receives from the soil must first have been absorbed by the fungus and taken from the fungus by the plant. The so-called saprophyte is, therefore, completely parasitic — parasitic on the mycorrhizal fungus. A recent report indicates that such parasites have been artificially created from seed-plants. Conifer roots, cut off from connection with the parent tree, were found to continue to grow and to store starch, if their relation to the fungal associate was left undisturbed.

The majority of mycorrhizal plants are able to synthesize their own starch, but otherwise many of them bear the same relation to fungi as does Indian-pipe. In any of the higher plants, absorption by roots takes place in a short region immediately back of the root-tip; older roots form an impermeable barrier beneath their surface which prevents water movement. When this narrow band of absorptive root is enclosed by a sheath of mycelium, it is no more able to absorb materials from the soil than is the Indian-pipe root.

Most forest trees have such a sheath and are, therefore, dependent on mycorrhizal fungi for all materials that they cannot absorb from the air. That they are not independent has been discovered in attempts to grow seedlings in forest nurseries far from the trees' normal range. Repeatedly it was found that the seedlings soon died unless soil (and soil fungi) from areas where the species already grew was spread over the seedling beds, or unless young trees already bearing mycorrhizae were set out among the seedlings. Sometimes, when many of the seedlings declined or died, others in occasional patches throve; the former proved to be lacking in mycorrhizae, the latter to have been invaded by a suitable fungus.

Even plants whose roots are not covered by a mycelial sheath may possess an internal network of mycelium, connected to the soil by delicate threads penetrating the epidermis. Such plants are as dependent on the fungus as are the others. Orchids and many Ericaceae have the surfaces of their roots in contact with the soil and yet cannot live without the fungus.

About the general occurrence of mycorrhizae there is no question, and the necessity of mycorrhizae to the plants that bear them has been repeatedly demonstrated. The exact function of mycorrhizae is not so satisfactorily settled. Certainly for some mycorrhizal plants, and probably for most, the fungus associate acts as the plant's absorption system. The widespread network of fungus mycelium

in the soil not only takes the place of root-hairs in absorption but is much more efficient — first, because it possesses a vastly greater surface for absorption; and second, because the fungus can secrete enzymes capable of digesting the organic part of the soil and can, therefore, not only absorb nutrients already in solution, but also render soluble complex organic substances that the plant alone could not touch. It is probable also that mycorrhizal fungi can synthesize some compounds which the metabolism of the plant cannot supply in adequate amount. In some plants (for example, orchids), the fungus can carry out within the cells of the plant necessary digestive processes that the plant cannot perform for itself. And finally, the fungus often alters the soil reaction (usually increasing its acidity) and may thus increase its suitability for the plant.

Less is known of the species of fungi that form mycorrhizae than of the plant species. Various Phycomycetes, the most primitive of the mycelial fungi, are reported to be mycorrhizal, but many of these reports are based on inadequate identification. Of the Ascomycetes it is probable that all truffles (Tuberales) and all false truffles of the Elaphomycetaceae are mycorrhizal. Among the Basidiomycetes, such well-known mushroom genera as *Amanita, Russula, Tricholoma,* and *Boletus* have many species which cannot persist except in mycorrhizal association with woody plants; the same is true of many Gasteromycetes — probably not the commoner puff-balls, but certainly most subterranean species. And many mycorrhizal fungi, because their fruiting-stage is not known, are assigned to the Fungi Imperfecti.

If the plant is dependent, and even wholly parasitic, on the fungus, what benefit does the fungus derive from the arrangement? Probably carbohydrates, in addition to those that the fungus can absorb directly from the soil. And probably also complex organic materials, of the class of growth-promoting substances, that the fungus cannot synthesize for itself. The great multiplication of mycelial branches in contact with the root would in itself suggest stimulation by such compounds. The mycorrhiza may then be regarded as an association of mutually parasitic mycelium and root, with mutual benefit.

If mycorrhizae are essential for the best growth of plants in nature, how can their formation be encouraged? Certainly not all the answers are in, but three practices are known: provision of an adequate amount of incompletely disintegrated organic material in the soil; avoidance of an oversupply of nutrients, especially nitrogenous ones; and, where plants are started from seed in new or sterile areas, seeding with some source of mycorrhizal fungi—soil or mycorrhizal individuals of the same species. Thus, dependent green plants can be provided with the biological associates which in nature furnish the materials for their development.

The complete root system of three plants of Indian-pipe, *Monotropa uniflora,* is shown here; the two outer plants are beginning to send up flowers, the third is mature. The roots of most plants occupy a greater volume than the tops. The root mass of these Indian-pipes has a diameter about one-seventh the height of the plants; yet by means of the mycorrhizal associate, these roots absorb not only all the water and minerals, but also all the carbohydrates, used by the plant.

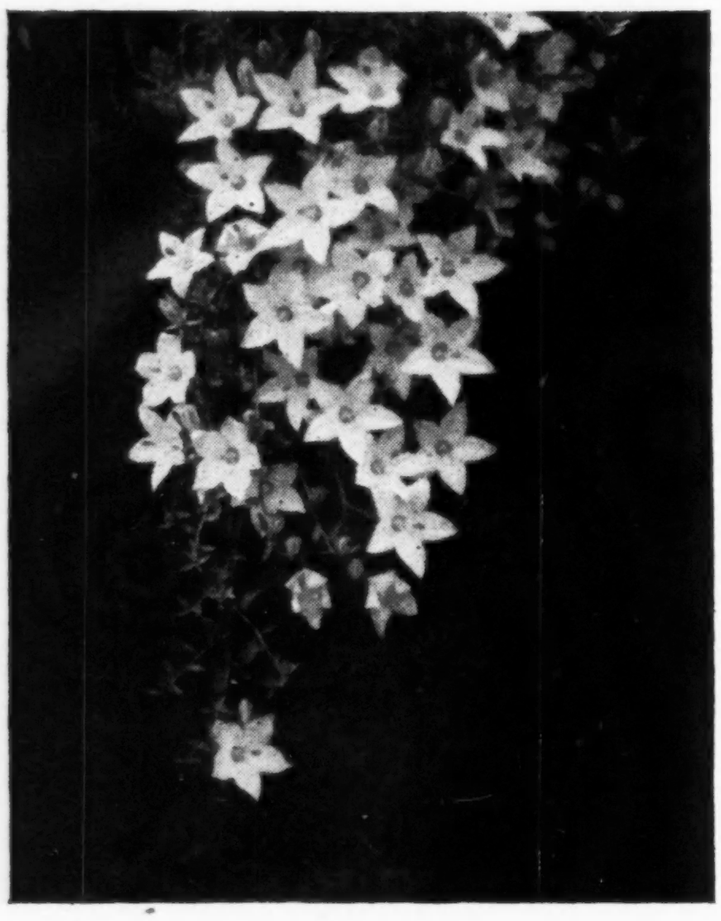
A MINIATURE ROCK GARDEN

By Robert M. Senior

MANY years ago, we constructed a small table garden, a miniature rock garden, in the center of our greenhouse. If your greenhouse is too narrow to permit the erection of a center table, you can use a corner of one of the benches, separating it from the potted plants by a board partition. The table, about three feet high and about five by six square, is supported by iron uprights. Around the sides are six-inch-high boards. We had the inside painted with a wood preservative and the outside was given a coat of white paint.

The number of small plants that can be grown on such a table garden is truly astonishing. In our six by five foot garden, we have approximately one hundred fifty plants. If all of them were kept in pots, they would take up several times the amount of space. Moreover, the plants bloom more profusely and thrive better than they do in pots; so from this standpoint alone, a miniature rock garden justifies itself.

An endless variety of plants can be grown — the only limitation is that they should not be too tall. Creeping veronicas, *Phlox subulata* and *amoena,* thyme, the tiny *Sedum dasyphyllum* that will spread over a rock, small sempervivums, *Androsace sarmentosa, Potentilla verna, Erodium chamaedrioides, Iris cristata, Primula acaulis, Armeria caespitosa* (*A. juniperifolia*), *Campanula muralis, Aquilegia pyrenaica* are just a few that come to mind. In addition, tiny evergreens, or even a rooted cutting of boxwood or juniper, can be placed in advantageous positions. And then, such plants as *Antirrhinum asarina, Saponaria ocymoides* and *Campanula fragilis* can hang over the sides.



Campanula fragilis **hangs gracefully over the sides of a miniature rock garden.**

The greenhouse shows its first bloom some time in February, possibly beginning with the armerias and primulas. Almost every plant blooms earlier than it does outside. From then until hot weather intervenes, there is a succession of flowers. After that, the garden is dismantled and the plants are taken outdoors.

But even then you can make use of your table garden, for you can remove the rocks, level off the mountain, and fill it with chrysanthemums that you had previously potted up for just this purpose. Possibly you wouldn't use it for specimen plants, but you could secure blooms much earlier than outdoors. After they bloom, the chrysanthemum garden must be dismantled and the soil discarded, to make way for next year's miniature rock garden.

In the fall, before the ground freezes, we prepare a compost consisting of about two parts loam, one part leafmold, and one part sand, and to this we add a small amount of fertilizer. Then, as we build up our miniature rock garden, we place small rocks projecting above the surface. Usually, we arrange to have the largest at the summit of our "mountain" and, of course, the base is a trifle lower than the top of our so-called retaining walls. Each year we slightly modify the contour of the ground, with valleys, crevices, and tiny hills. Incidentally, after our planting is completed, we scatter tiny pebbles over the surface, which seem to improve its artistic appearance.

We have found from experience that it is not advisable to plant the garden too early in the fall. Before the ground freezes, we put our plants in small pots and plunge them in a coldframe, with a raised sash over them. Here they undergo a resting period. When we bring them into the greenhouse in January and knock them out of their pots, they seem prepared, in due course, to bloom profusely. On the other hand, if they are planted in the greenhouse in early fall, there is a tendency for them to grow vegetatively at the expense of bloom.

"DO PLANTS THINK?"

JIMMY Jemail, the Inquiring Photographer of the "Daily News", recently put the question "Do plants think?" to T. H. Everett, Horticulturist of The New York Botanical Garden. Here is Mr. Everett's answer:

"There is the distinct possibility that plants may have consciousness. In *Mind Energy,* the French scientist, Henri Bergson, points out that 'theoretically, everything living might have consciousness. In principle, consciousness is co-extensive with life.' However, if plants are conscious organisms their minds are associated with something entirely different from the brain and nervous system of higher animals.

"However, if we choose to deny the possibility that plants think, we must be prepared to explain just where in the evolutionary scale, which extends from man down to the low amoeba and beyond, consciousness, as we know it, ceases to exist. No one knows, because, in its simplest forms, living matter is not divided into plants and animals. Sir Gagadis Chunder Bose poses a query similar to the one you sent to me when he asks, 'In man himself, from the moment the ovum is fertilized until he becomes fully grown, when does consciousness come into existence?'

"That's why I say that plants may think. No one can disprove it."

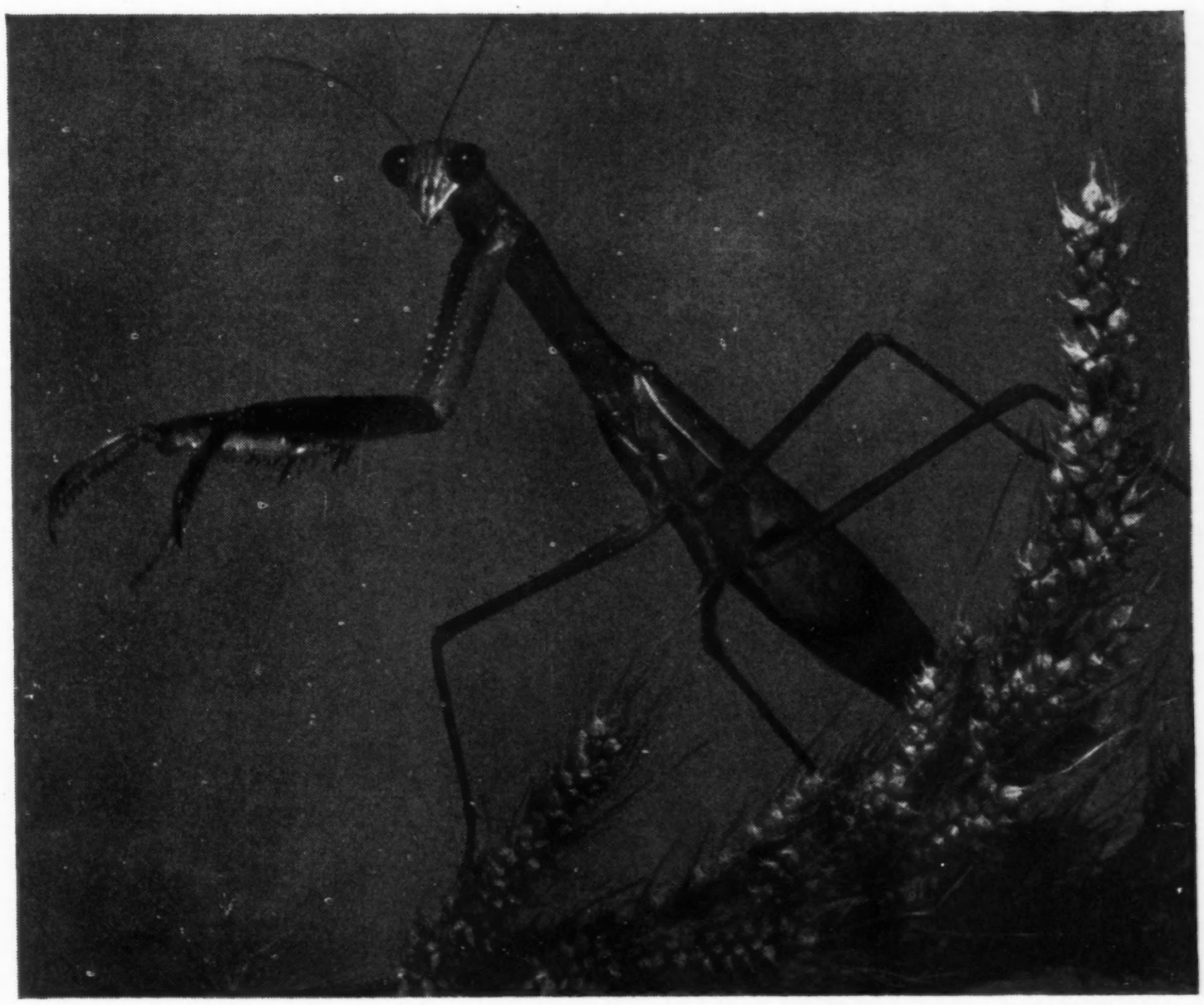
Mr. Everett's reply, which appeared

(*Continued on page* 154)

For the Younger Generation of Gardeners

INSECTS — Friends or Foes?

By Edith D. Thomson



The praying mantis, a very odd-looking insect, is a real friend to man.

ARE you one of those "I hate bugs" boys or girls? Or do you just dismiss all insects, by saying they are pests? I hope not but, even if you are, stay with me awhile for I hope to change your mind and make you see that we have many insects that are not pests and that they are all very interesting.

Let us start with the praying mantis. You see many of them this time of year. A few years ago, they were a novelty but they have increased rapidly. You can probably find one without much difficulty in your garden or in the park for they are not afraid of you. This is an unusual looking insect, you must admit, with its triangular head and bulging eyes on the corners of the triangle. It is about two or three inches long, brown except for the body and feet which are sometimes green. Sometimes, the females are all green. The front legs have saw teeth on the edges which they fold over; it is these legs, held up in an attitude of prayer, which give the insect its name, praying mantis. These "saws" really are weapons and woe betide any insect which comes within reach, for then the forelegs come down, and the "saws" grasp and hold the prey while the mantid daintily bites and chews all the soft parts of its victim's body, discarding the legs, wings and any hard parts. To tell the truth, the female frequently eats her mate!

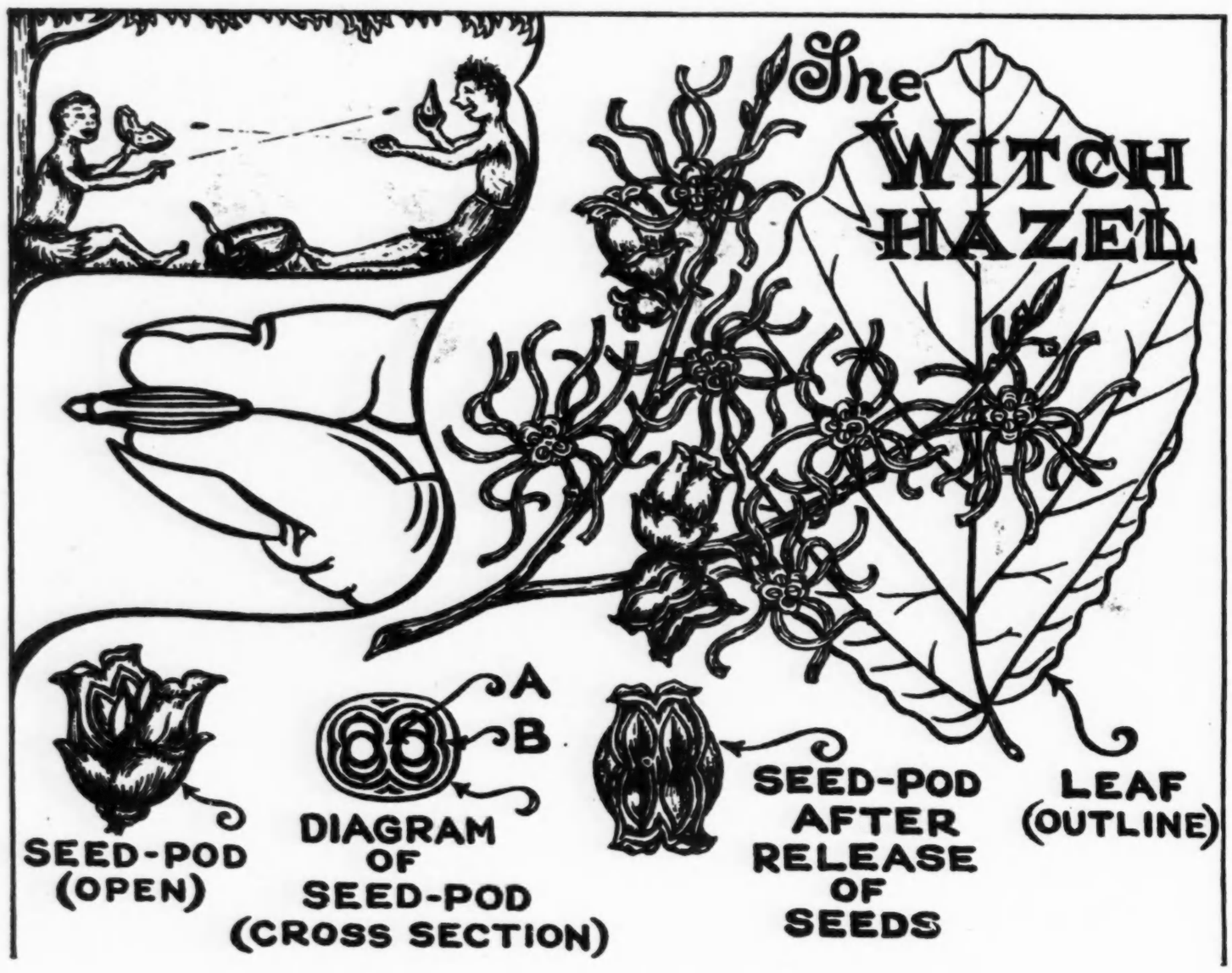
In the late summer and fall, the mantid deposits her eggs in a mass on branches or plant stems. These are covered with a quick-drying mucus which looks like hardened foam. After this she will crawl away and die, her life work done. Next spring, out of this short, broad, cornucopia-shaped egg mass will hatch hundreds of little creatures about the size of tiny mosquitoes. They hang down on little threads and soon scurry away in search of food. You probably won't see them again until next fall when they are fully grown, but in the meantime they have been growing up, molting several times and developing wings. All this time they have been eating insects which are destructive to crops, so we call them our friends. There is no truth in the statement that there is a fine for killing one. They make good pets. Why not try to keep one a few days? You will notice it can turn its head, even look over its shoulder. It is the only insect that can do this.

Now, I've told you about a good insect. Next, we shall think about an insect family which is really a pest, the aphids or plant lice. The mantid is a chewing insect but the aphid has no mouth, only a sucking tube. The usual color of these insects is green and this protects them as they feed on leaves or stems. You will find them crowded on tender leaf stalks, little ones in between big ones, some even resting their hind legs on the antennae of those behind them, all sucking the juice of the plant for dear life. A hand lens will help you to examine them for the insects are very small. They make sap into honey-dew. The ants love this honey-dew. They stroke the backs of the aphids with their antennae and are rewarded by a drop of this sweet food. In fact, aphids are called "ants' cows" and many kinds of ants go to great trouble to care for them. The ants store the aphid eggs in their nests in the winter and when the eggs start to hatch in the spring, the ants bring them out and place them on roots or stems where they will produce more sweets.

A female aphid does not lay many eggs in comparison with insects in general, but development is so rapid and there are so many generations a season that it is lucky for us they have enemies. During the summer, most of the aphids crowded on plants are without wings. These are females which, in turn, produce other females. They do this until they are overcrowded and the food supply seems to be running low, then winged individuals are produced. These fly to another plant and

(*Continued on page* 152)

PLANTICS



Witch-hazel . . . what a familiar word this is to many of us! Some may associate the word with the extract that is distilled from the juices of the leaves and twigs of the witch-hazel tree. Others may associate this word with recollections of "witch-hazel wands" which were used to "indicate the presence of water", thus marking the site for a new well.

Actually the word "witch" as employed in witch-hazel may be traced to the old English word "wych", meaning weak. This does not, however, apply to the strength of the wood but to the sprawling or drooping habit of the tree.

This sprawling, straggling tree flowers long after all other woody plants have ceased to flower. Its yellow flowers appear late in autumn and often continue to bloom long into winter. It is not uncommon to see, on a wintry morning, a witch-hazel tree in full flower with the branches bare of leaves and covered with frost.

Each flower has four petals, a half inch or more in length, resembling tiny pieces of bright yellow ribbon. Each flower usually produces two woody capsules (seed pods) which require a full year to mature. By the time the new crop of flowers appears, the seed pods (of the flowers of the previous year) are fully ripened. Dry cold weather will cause the seed pods to open explosively, catapulting the seeds with considerable force to distances often exceeding thirty feet. If one should happen to be in a grove of witch-hazels at the moment when the capsules start discharging their seeds, he might imagine himself to be the target of artillery fire of several Lilliputian armies.

Now, what has all this to do with a plant antic or "plantics"? It all lies in the fact that in each seed pod there are two cells with a bony seed. These dark brown, white-tipped, polished pellets resemble large grains of wheat. Around the seeds there is a bony inner lining which contracts the instant the seed pods open. This shrinking causes pressure to be exerted on the seeds (see above diagram of seed pod, points A and B) just as if a boy were to pinch a watermelon seed between his thumb and fore-finger, causing it to shoot out into space. After the seeds are ejected, this inner lining contracts even more as the picture above shows.

MAC KEEVER

Younger Generation

(*Continued from page* 151)

start a colony there. This continues all summer or as long as the food supply lasts. When cold weather approaches, then males and females are born. It is the duty of these females to lay eggs which will last over the winter months. The next spring, each egg will hatch into a female whose descendants will populate the plant. Plant-lice vary in their habits. Some live on roots but the greater number live on the tender foliage and stems of green plants. All do great damage. Their insect enemies include the aphis-lion and the lady-bird beetle. They are also the victims of parasitic insects.

The lady-bird was mentioned as one of the enemies of the aphids. This is the lady-bird of the old rhyme you have all said,

"Lady-bug, lady-bug! Fly away home
Your house is on fire
Your children will burn."

Haven't you wondered what this was about? It is said it started in Europe where they burn the hop vines after the harvest. These vines are usually full of aphids and larvae (children) of the lady-bird. I'm sure "Mrs. Lady-bird" would never recognize her own children for they do not look the least bit like her. They are long and velvety with six short legs that seem only good for clinging around a stem. Their business in life seems to be to crawl around and devour aphids. After the larva has eaten many, many aphids and has shed its skin several times, it hunts a quiet corner, hangs itself up and becomes a pupa. In a few days, out comes a full-grown lady-bird. Some species have the habit of passing the winter in great masses on mountain tops. These are collected, put in cold storage until wanted, and then sold to farmers at the right season for controlling aphids.

Are these life stories interesting? Then why not go out in your yard, the park, or even on the pavement and see what you can find. I am sure you will find something interesting, if you really look. See how much you can find out for yourself and then go to the library for more information.

Alpine Conference

(*Contined from page* 139)

either at the show or outdoors in gardens, I made note of *Geranium Renardi* with crinkly leaves, *Ranunculus graminifolia* and charming *Asperula nitida.* A feature was made of the double-flowering bloodroot, *Sanguinaria canadensis multiplex,* a native of eastern North America, and I also noticed American trilliums and cypripediums, and such North American shrubs as *Ledum palustre* and *Andromeda polifolia,* though, to be sure, these are also native to Asia. In gardens, California erythroniums were grown in round spots dug out of lawns and in full sun.

Besides the show and lectures, the Alpine Garden Society arranged two outings, one to Wisley and another to Kew which included Windsor Great Park. Both at Wisley and Kew, as along many streets, there were newly-planted flowering cherries and crabs to bring color overhead — something which they needed, for they have enough on the ground. In the two botanic gardens, especially at Wisley, shrubs espaliered against tall walls, previously known to me only from writings, were delightful to see. These include many evergreen barberries, not-hardy buddleias, rare and not-hardy magnolias, dipelta, ceanothus, veronicas, and so on. Also in Wisley, there is a planting entirely of rhododendrons, some of them particularly handsome, and elsewhere on a slope thousands of *Narcissus bulbocodicum* are naturalized in the grass. In the rock garden are rarities which are becoming old friends. Plants which are practically weeds there are the charming anemones, *A. nemorsa, A. blanda* and *A. apennina.*

From London the group went to Edinburgh for the second week of the Alpine Conference, where the headquarters were at the justly famous botanical garden. Papers were read at this session as they had been read in London. I particularly liked the paper presented in London by Colonel F. C. Stern, one of the outstanding horticulturists in Great Britain, on "Uncommon Rock Plants", and the talk, accompanied by colored films of alpine plants, which was given by Mrs. G. R. Marriage of Colorado Springs, Colorado. The most interesting to me, in the Edinburgh session, was a motion picture of plant collecting in southeast Tibet and Bhutan shown by Major George Sherriff who had taken it at 15,000 feet above sea level. He photographed marvelously beautiful plants, particularly rhododendrons and primroses, often outlined against the snowy Himalayas. It has been found that Edinburgh and its environs have exactly the right climate for these Himalayan plants, namely the dampness, coolness, and more or less even temperature and, consequently, the plants thrive. The

***Cyclamen neapolitanum* is a delightful little bulb for rock gardens.**

lesson to be learned was obvious — namely to go back home and grow plants suitable for our conditions; not to try to grow importations from high altitudes and cool climates but such natives as our own iris, phloxes, dodecatheons, erythroniums, trilliums and cypripediums, azaleas, dogwoods and other natives, as also the collection of material, much of it brought in by the late E. H. Wilson, from eastern and central China and from Japan.

There were excursions to fine gardens, well cared for and planted with some of the same material to be seen growing in the Royal Botanic Garden at Edinburgh but having, of course, a more intimate and personal effect.

After the Edinburgh meetings were over, four Americans, Mr. and Mrs. Harold Epstein (Mr. Epstein is president of the American Rock Garden Society), Mrs. C. U. Berry from Oregon, and I, in company with Mrs. N. V. Cooke, of The Ingles, Greenisland, an American married to an Irish gentleman, flew to Belfast. The next Monday we were invited, through Mrs. Cooke, to go on an outing of the North Irish Alpine Society. A special bus had been hired and off we went to famous County Down. First we saw Castlewellan, the garden belonging to Sir Gerald Annesley, and planted with superb evergreens, eucalyptus, palms and redwood trees, all of these now tall and spreading though only in their places for the past sixty or so years. The garden is so handsome and so rich in rare material it deserves many hours of attention. From there in the icy rain (most of the women were dressed as for winter with felt-lined boots, fur-lined gloves and many layers of woolies, covered with tweeds, and all topped by rain-proof and becoming hats), we all walked down the valley to three gardens in Newcastle. The first, Enniskeen, belonged to Mrs. C. C. Lindsay; the second, Moylena, to Miss Violet McNaughton; and the third, Ashleigh, to Miss Winifred Coey.

The most conspicuous wild plant in Ireland is the yellow-flowered gorse, *Ulex europaeus.* Everywhere, in cottage gardens as well as in more elaborate ones, are handsome specimens of ribes, said to be a hybrid with one parent *Ribes sanguineum.* The flowers in fairly long racemes were a deep red. Another conspicuous plant is a hybrid barberry, reported to be the offspring of a cross between *linearifolia* and *Darwinii,* having bright orange persistent flowers which literally cover the whole bush. Specimens of Irish yew are often planted dramatically.

The Irish visit included a trip to Rowallene, belonging to Hugh Armitage-Moore, in County Down near Saintfield, one of the fine gardens of today. The formal walled garden is so large that low trees rising from beds seem to cast only a limited shade and furnish a cover for lush-growing strong clumps of lilies. Outside of this garden the famous rhododendron and azalea collection is planted amid rolling downs, and unusual trees, such as stewartias and davidias, are planted to leave vistas across the hilly country to distant views.

From Belfast we went to Dublin where we visited the garden of Mr. and Mrs. H. E. Guiness, called Danesfort, in Dublin County. The house faces the sea and the garden is planted among the natural rocky surface of

cliffs. In my opinion, it is the finest rock garden I have ever seen, because it is right for its environment, done with a sense of form and color and furnished with well selected plants, not all rare or different, but harmonious to their background and to each other. The garden is twenty years old and the plants have had time to spread and become interlaced. The owners know their plants and use no labels.

Not far away is Howth Castle with a new garden laid out by Sir Edwin Lutyens and a very old garden with beech alleys twenty-five feet high and plantings of rhododendrons.

In Dublin is the Glasnevin Botanical Garden. It is very well cared for and among other features has large collections of helleborus and of species peonies.

A charming feature of southern Irish landscape consists in the old stone walls surrounding the fields. With the passing of years, they have become wall gardens. Wildlings have seeded themselves in the earth which has gradually filled in the spaces between the stones, over which ivy climbs very tightly. In mid-May, at the time of my visit, there were the terrestrial Wicklow orchid, English daisies, violets, arabis — I think, *muralis* and there called cuckooflower — geraniums, blue-bells (scillas), which grow in almost every shaded spot. Behind all this would rise a hawthorn hedge and sometimes a hedge of *Prunus,* which they call blackhaw and which was then in bloom. Along the rocks on the margins of the sea grew low tufts of pale pink thrift. On banks and in meadows *Primula veris* and *Primula acaulis* were blooming.

The last garden to be seen was on an island in Bantry Bay at Glengariff, belonging to Roland Bryce and called Ilnacylim in Gaelic and Garnish in English. It is a dream place with Italianate loggias and a steep stairway leading up to a round tower, part of the hastily built fortifications as a defense against Napoleon's expected invasion. There, too, are superb shrubs, palms, eucalyptus and rhododendrons as high as trees and smothered in bloom. There is a walled garden, terraced up the hill where vegetables are being grown. I wish we could have been there in fuchsia time, but that will have to wait for another day.

Highbush Blueberries

(*Continued from page* 136)

April, and are also easily established in September and October. As they are in full leaf the latter months, they should be pruned back.

It should be remembered that the highbush blueberry is only one of several species of blueberries from which crops are picked in the United States. The lowbush blueberry, (*Vaccinium angustifolium*) is harvested extensively from the wild in New England and parts of Canada, and the Rabbiteye blueberry (*Vaccinium ashei*) is harvested from the wild and from limited cultivation along the southeastern seaboard. Since the different species are adapted to such varied conditions and even though they have different chromosome numbers, there is considerable interest in and rather surprising success with interspecific crosses. This is a new phase of the breeding work, one which is progressing along with the normal crossing of promising selections within a given species.

The development of the relatively new blueberry industry can be easily traced through the various publications of the U. S. and State Departments of Agriculture, which are available at nominal fees from the respective institutions. Also, the parents of all the varieties from crosses can be traced, which again is an added advantage over the majority of our other fruits. Since it is such a recent development, and since the possibilities are so great, it is more or less a fruit breeders' "Paradise".

Do Plants Think?

(*Continued from page* 150)

in the "Sunday News", elicited a very interesting letter from Charles H. Harrison of New York City. It also inspired Mr. Harrison to write a sonnet. We have received permission from Mr. Harrison to publish his letter and sonnet in the pages of The Garden Journal of The New York Botanical Garden.

"I was fascinated by the question, 'Do plants think?' — and its answer— in yesterday's 'Sunday News'.

"My father was a Canadian detective — quite rugged and taciturn and not the type that one would think to be particularly conscious of horticulture. Without knowing that he had been competing, however, he found that the Civic Association had awarded him a medal as first prize for the most beautiful grounds in our part of Toronto. That started him in earnest and he devoted the rest of his life to horticulture: first, while still a detective; then later, upon retirement, in the raising of flowers for exhibition. I have inherited his interest, though nothing whatever, I am sorry to say, of his knowledge or aptitude.

"I have often wondered as to the real nature of animals (the 'lower' animals) and plants and flowers. I have concluded that they are all of much greater importance, and of much more mysterious nature, than man understands. I have felt that flowers and plants have a form of awareness that we do not understand. I could relate two strange things about this that I would not have ventured even to tell my father — though, for all I know, he may have known things that were still more strange (maybe that, in fact, was the background of his interest).

"In any event, I want you to know that your response to the question, 'Do plants think?' moved me, last night, to write the enclosed sonnet on that subject. Please do not feel that it needs to be returned."

These buds of roses greet one's gaze with red
As tongues of flame, apostles' eyes of yore;
Their leaves, so green — what other green is more! —
And from Elysian fields their scent is bred.

Could one believe that consciousness has fled
Though once 'twas there Creation's fall before?
Or must one with an aching heart deplore
Awareness having been forever dead?

Could anything so blessed and so fine
Whose gifts are spread abroad for all to share
Have consciousness less true than yours or mine?

Could anything responding so to care —
And if abused, so quickly then repine—
Be not indeed, in its own way, aware?

The Garden's Supporting Cast

WILLIAM DRESCHER

By Ruth V. Caviston

WILLIAM Drescher grew up in New York. When he was eleven or twelve years old, he worked during the summer vacation for an architect and builder, carrying plans to be estimated on to manufacturing plants, stone yards, foundries, and sash mills. As a result, he became familiar with the city and learned to know the town better than most people. He remembers the cemetery that was located at 50th Street and Ninth Avenue; when squatters lived around Eighth Avenue and 60th Street; and when a trip to 125th Street, then known as Manhattanville, was "out of this world."

But it was not all work for the young boy. As soon as warm weather set in, every Sunday was "picnic day" for the Drescher family and their friends. Their favorite picnic groves were at College Point and Staten Island. These affairs were conducted in a typical German manner — there was plenty of good food and, of course, the "Dutchman's" favorite beverage, lager beer. While the children threw themselves wholeheartedly into one game or another, their parents reminisced about the homeland and sang German songs. On all these outings, however, Bill's mother, who loved nature, pointed out to him various wild flowers in the vicinity. She was unable to identify many of the plants, but her enthusiasm kindled a response in her son.

Mrs. Drescher was a firm believer in education. When Bill was growing up, most children left school at twelve and started to work. But she persuaded him to continue. He won a scholarship at the Workingman's School which was conducted under the auspices of the Society for Ethical Culture. In those days the school conducted natural history excursions and Bill still remembers his class' first visit to Bronx Park. He has vivid recollections of the columbines, moccasin flowers and trailing arbutus as they used to grow there.

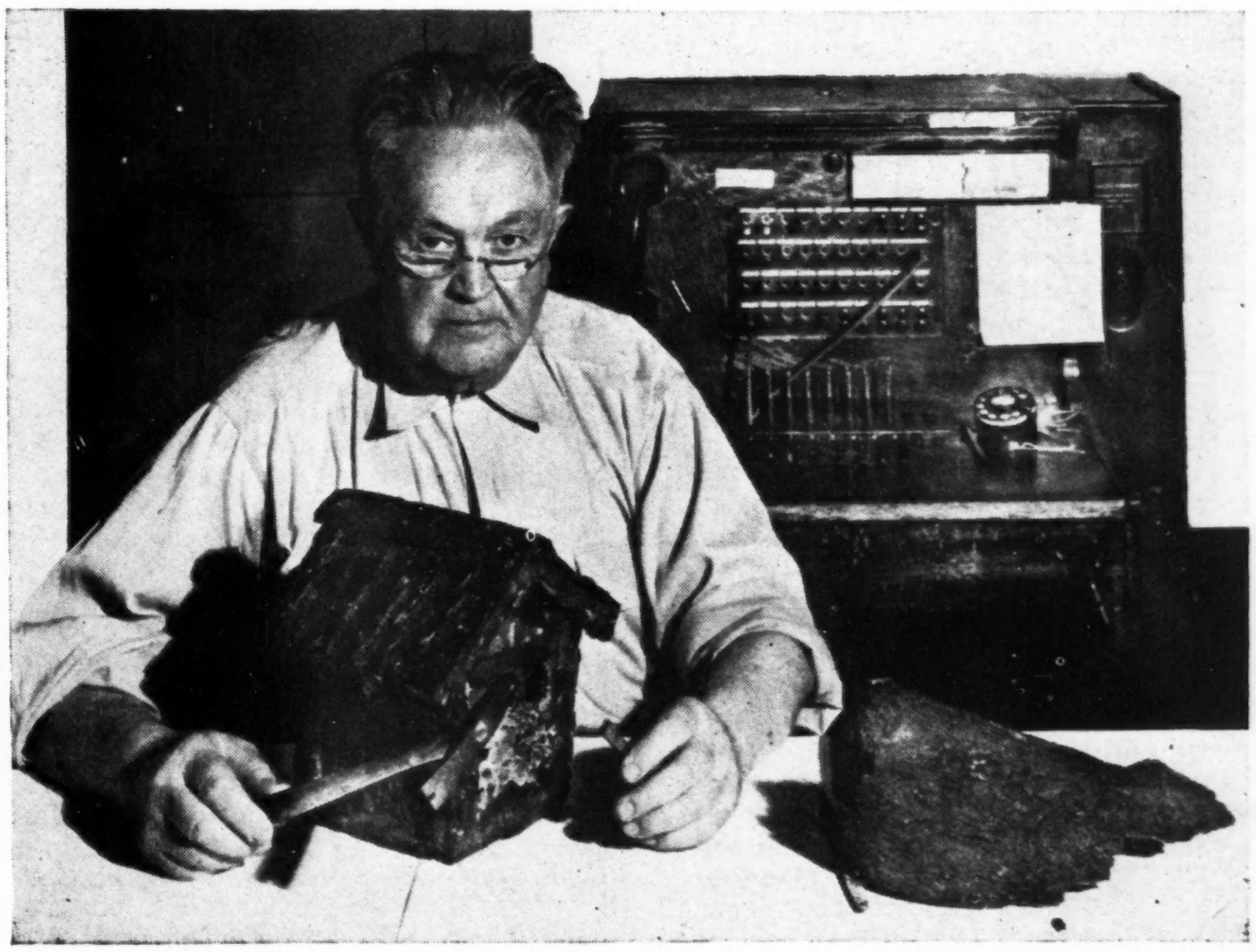
Mr. Drescher held various jobs before he settled down in the printing business as a pressman. After fifty years of working on all kinds of printing, including color work, and all types of presses, he retired. But retirement proved irksome to such an active man.

Even his hobby, the observation of bird life, did not occupy enough time. For years Bill had spent many of his leisure hours following this pursuit at The New York Botanical Garden, and in 1926 he became acquainted with a group of men with similar interests, who usually met on what is now Boulder Bridge in the Garden. The bridge was always crowded during the spring and fall bird migrations. Roger Tory Peterson, the noted bird artist and writer, was a member of this group. So was Allan Dudley Cruickshank, the famous wild life photographer, author and lecturer.

Since he was spending so many hours at the Garden, especially after his retirement, Mr. Drescher decided to apply for a job here. When an opening occurred, he was hired as one of our maintenance men. This involved work such as spraying trees, sawing wood, and patrolling certain areas of the park. The latter was not to his liking. Big, gruff, blunt William Drescher admits he has little patience with people, especially with those who "confuse liberty with license," as he puts it. So, in 1946, arrangements satisfactory to everyone were made for him to trade his job with that of a night watchman. Since then, Mr. Drescher has worked in the Museum Building on the 4:00 p.m. to midnight shift.

Discounting the time consumed in making his rounds, checking windows and doors, and answering late calls at the switchboard, Mr. Drescher still has leisure hours on the job. These he uses to good advantage. Our night watchman is an avid reader and is particularly interested in books dealing with history and travel. He is familiar with much of the literature of Europe and America, both past and present. He speaks German fluently, and can make himself understood in French and Italian. He also taught

(*Continued on page* 159)



William F. Drescher puts the finishing touches to a bird house, as he watches the switchboard at the New York Botanical Garden on his four to midnight shift.

AN INTRODUCTION TO THE EMBRYOLOGY OF ANGIOSPERMS. P. Maheshwari. 453 pages, illustrated, indexed. McGraw-Hill Book Co., New York. 1950. $6.50.

Strictly defined, a book on embryology should be concerned with the development of the embryo. Fortunately, Professor Maheshwari uses the term in a far broader sense, to include the intricate preliminaries to that process. The chapters deal, successively, with a historical review, the microsporangium, the megasporangium, the female gametophyte, the male gametophyte, fertilization, the endosperm, and the embryo. The final presentations are concerned with apomixis, polyembryony, embryology in relation to taxonomy, experimental embryology, and theoretical conclusions.

The only previous volume, somewhat similar in plan, written in English, is Coulter and Chamberlain's *Morphology of Angiosperms*, published near the beginning of the present century. In German, however, there are the three treatises by K. Schnarf, to which the present author makes due acknowledgement. Johansen's *Plant Embryology*, which is of somewhat wider and different scope, was also published in 1950.

Professor Maheshwari's book is not designed for fireside reading. The chapter on the female gametophyte, for instance, covers seventy pages. Ten main kinds of embryo sacs are taken up in detail, starting with the 8-nucleate "*Polygonum* type", characteristic of some 70 per cent of the investigated angiosperms. Modifications of each form are elaborated, and there is a final consideration of "aberrant and unclassified types".

In the treatment of the embryo proper, five main categories are recognized among the dicotyledons, beginning with the classical "Crucifer" type illustrated by *Capsella*, and including in turn the "Asterad", "Solanad", "Chenopodiad", and "Caryophyllad" types. Monocotyledons are dealt with separately, and the chapter ends with a discussion of "unclassified or abnormal embryos" and "unorganized and reduced embryos."

The pages on "Apomixis" and "Polyembryony" serve as thoughtful introductions to these stimulating fields. "Embryology in Relation to Taxonomy" outlines the contributions of embryology to the understanding of certain families of dubious relationship, such as the Empetraceae and the Callitrichaceae. Students of taxonomy will wish that this chapter were longer. In analyzing recent work on experimental embryology, such topics as "Control of Fertilization", "Embryo Culture", "Induced Parthenogenesis", and "Induced Parthenocarpy" are considered from a modern viewpoint. The final word on these subjects has not been spoken, and of the questions raised, not all are answered — which is understandable in science.

The references at the conclusion of each chapter bespeak the breadth of outlook of the author and his familiarity with the investigations and languages of both the old world and the new. The illustrations have mostly been assembled from the literature, but many of them have been effectively redrawn, often by the author. Professor Maheshwari has written a scholarly volume that will serve for years to come as a guide and a stimulus to students of the embryology of the angiosperms all over the world, most of which he may never know.

Edwin B. Matzke
Columbia University

THE ART OF COOKING WITH HERBS AND SPICES. Milo Miloradovich. 304 pages, indexed. Doubleday & Co., New York. 1951. $2.95.

This is the third book in which Miss Miloradovich has dealt with the art of gastronomy and is definitely a book for either the beginner in the art of using herbs or for the completely experienced gourmet. However, as this includes practically everyone who desires to use herbs, Miss Miloradovich's following should be large.

Each herb is listed, with botanical name, and a couple of paragraphs are devoted to a description of the growing plant and any outstandingly unusual facts about it. Then, and this is what should make this book invaluable to the beginner in herb cookery, the author lists the various dishes in which it may be used and how much to use. For instance, she suggests that rosemary appear in appetizers, eggs, fish, game, meats, poultry, soups and vegetables.

As to the book's use by a connoisseur, there are many unusual recipes and many unusual uses suggested, that will not be fully appreciated by the cook until custom is about to stale his no longer infinite variety. What fun to get out of the rut by making angelica liqueur, pickled chive bulbs, rose petal syrup, caraway cheese wedges, and Swedish gloegg. See? You haven't even begun to live!

Miss Miloradovich's most ardent admirers might begrudge the space that is given, in a most impartial way, to what are thought of, in America at least, as being very definitely non-culinary herbs, but it is easy to see why she did. She just became so fond of the whole tribe that she couldn't bear to overlook even the lame and the halt and the blind. While no herb gardener need feel apologetic for leaving tansy, rue, hyssop and bergamot out of his culinary garden, still this author makes their inclusion in her book interesting and their use less problematical than intriguing. She supplies an answer to those people who stand about your herb garden and pay no attention while you expatiate on the many uses of sage, thyme, and parsley, and then sieze on some plant that is only there because of its ancient lineage or the beauty of its foliage, like rue, and demand, "What do you use that for?" in piercing tones. Miss Miloradovich says cheese, drinks, ragouts, salads, stews and vegetables. Hitherto, I have answered with icy simplicity, "To cure croup in fowls".

A book as useful to the great majority of herb growers and users as this one is bound to be will run into several editions. Before it does, someone will probably have induced the author to gild the lily and correct some of her botanical statements, for she is not what is known as a "born botanist". However, you can't but admire her confidence — she is in there swinging with flat statements, let the Grays and Linnaeuses fall where they may. She fell between two stools on caraway, calling it "a hardy perennial (sometimes an annual)", while usually trustworthy sources claim it for the biennials. Leeks are a hardy perennial in my northern garden and the lemony scent of bergamot is commonly limited to the variety *citriodora*, and that one doesn't have red flowers. If she will live with the marjorams, she will find that oregano is not what is listed and grown as wild marjoram, no, nor pot marjoram either, but is a very definite variety of its own. When the experts get through wrangling perhaps we gardeners, like the Greeks, will have a name for it.

However, all this is mere pedantic caviling at details. In the main, it is a book to own and to browse through and to carry into the kitchen with you. Hand in hand with Miss Miloradovich, you are bound to come out with an excellent "dinner of herbs". Stalled ox is going on the ration and who cares?

Isabella Gaylord
Utica, N. Y.

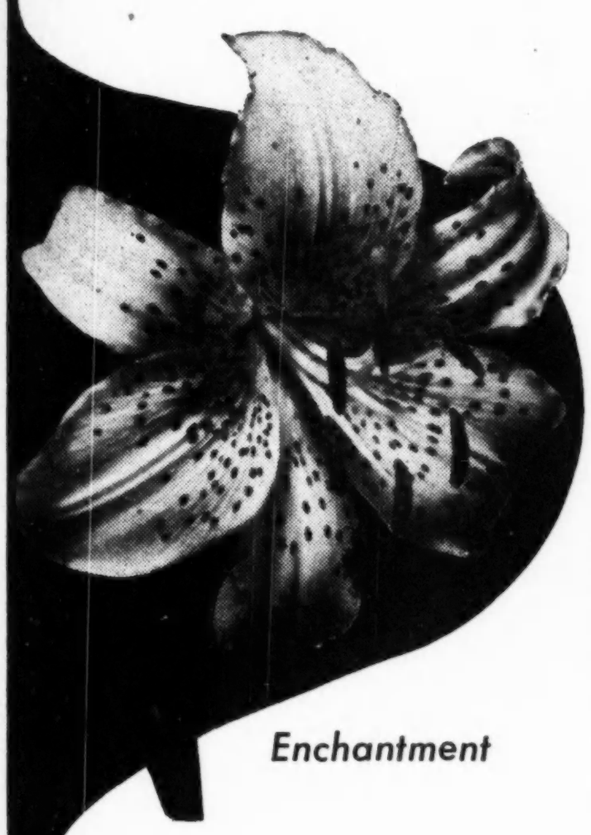
PLANT PATHOLOGY. John Charles Walker. 699 pages, illustrated, indexed. McGraw-Hill Book Co., New York. 1950. $7.50.

In the preface the author states that "The purpose of this text is to provide the basic facts whereby the student may be introduced to the scientific foundations of plant pathology. It is not a manual of disease descriptions nor a handy compendium of remedial measures." The student will find that the book more than justifies these modest claims.

There is an interesting chapter on the history of plant pathology. Others deal with numerous non-parasitic diseases caused by adverse environmental conditions and various nutritional deficien-

(*Continued on page* 158)

Wayside Gardens



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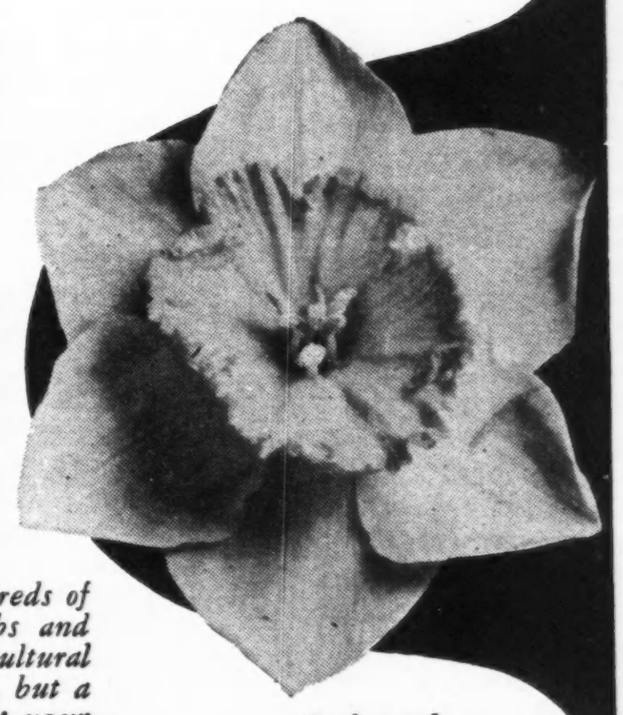

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Wayside Gardens

Book Reviews

(*Continued from page* 156)

cies. These are followed by nine chapters which discuss in some detail over seventy-five of the more important diseases of food crops, fiber crops and ornamentals. The diseases are grouped according to their causal agents rather than by crops. For example, one chapter deals with bacterial diseases, five with diseases caused by fungi, one with virus diseases, one with nematodes, and one with mistletoe and dodder.

Other chapters discuss the relation of environment to disease development and host-parasite interaction. The general principals of plant disease control are ably discussed in the last three chapters.

The text is written by an expert with a long and successful career in both research and teaching. The author also has the rare faculty of presenting his subject simply, clearly and systematically. The 194 well chosen figures and an extensive list of references add greatly to the value of the text.

The book should be well received by anyone seriously interested in plant diseases.

C. M. Haenseler
Rutgers University

PLANT BIOCHEMISTRY. James Bonner. 537 pages, indexed. Academic Press, New York. 1950. $6.80.

AN INTRODUCTION TO PLANT BIOCHEMISTRY. Catherine Cassels Steele. 346 pages, bibliography, index. British Book Centre, New York. Second edition, revised, 1949. $5.

These two books published within a year are two decades apart in outlook. The book by Bonner is chiefly about higher green plants and is written from the current viewpoint which assumes that the enzymatic processes of formation of a few essential substances are more important than the listings of all of the organic compounds found in plants. All who are interested in the physiology and biochemistry of plants, white and green, will need this book.

The book by Miss Steele, in contrast to the one by Bonner, is mainly descriptive biochemistry of the kind that was necessary in the early thirties before the enzymatic processes were worked out in detail. Many of the details have become clear only in the last few years and many more are still obscure. More naturally occurring compounds are discussed in this book than in the one by Bonner and for that reason it will be found useful. It is written for students who know much less organic chemistry than is required for reading the book by Bonner.

F. W. Kavanagh

HOMES AND GARDENS IN OLD VIRGINIA. Frances Archer Christian and Susanne Williams Massie (editors). 544 pages, illustrated, indexed. Garden Club of Virginia, Hotel Jefferson, Richmond, Va. 1950. $7.50.

The Garden Club of Virginia in compiling and editing this book has done a real service to all those who enjoy beautiful houses and gardens, both old and new. The text presents both the historic associations of the old houses with a resume of their development and their present ownership and accessibility. The inclusion of certain houses and gardens of more recent date takes it out of the class of purely historical pilgrimage books. Careful reading affords considerable insight into the economic and social history of Virginia from very early days to the present time.

The authors' enthusiasm and affection for the places show through so clearly that one's first reaction is to plan a special motor trip immediately so that certain homes can be visited. The only difficulty is that the more one reads, the longer the itinerary. The division into regions makes it useful, however, for short trips to one section of the state.

The photographs are excellent and give the reader enough of the character of the places to allow choice of the ones not to be missed under any circumstances. It is a volume to have on the library shelves for reference on early architecture and gardening, but also to take along on any journey into the localities it covers. Garden clubs in many other states would do well to sponsor as excellent a book of their own regions.

Mary Deputy Lamson
Landscape Architect

A FUCHSIA SURVEY. W. P. Wood. 170 pages, illustrated, bibliography, index. Farrar, Straus & Young, Inc., New York. 1951. $2.75.

This little book, whose author is president of the British Fuchsia Society, is a timely and important one.

Interest in fuchsias varies in different parts of the world — at the present time, it is practically nil in the New York region. A chapter on "Fuchsias in America" indicates their greater importance in California.

The book clearly shows that the fuchsia has much to offer. While it has immense possibilities as a greenhouse plant, we are told of many other uses to which it may be put. The cultural notes are original and educational as well as being highly humorous in places.

A descriptive list of the species based on Munz's revision of the genus *Fuchsia* is included, also a chapter devoted to a description of a selection of varieties and species.

James G. Esson
Great Neck, L. I., N. Y.

WEEDS. Guardians of the Soil. Joseph A. Cocannouer. 179 pages, illustrated. Devin-Adair, New York. 1950. $2.50.

The author has written this book on the theory of the weed as an ally rather than a pest. He tells how certain weeds increase the depth of the top soil with their deeper growing and penetrating roots, particularly pigweeds, sow thistle, lambs quarter, annual nightshade, ground cherry and ragweeds, provided they are not too thick, controlled, or used in rotation. The deeper penetration fiberizes the soil down to a lower level than the cultivated crops, bringing up many of the minerals and possibly many of the trace elements. This also aids in better aeration and capillary action of the soil. Many of the best crops are harvested from the weedy end of the field. Weeds also supply organic material to the soil and keep the soil from being too compacted by a hard rain.

The author leaves the control of the over-abundant supply of weed seed up to the farmer himself which, I believe, is the main reason for clean cultivation in the first place. In reading this book, someone may think of a plant that has the deep penetration, without the excessive supply of seed that pigweed has and is also less aggressive, that might be planted along with different cultivated crops.

Samuel F. Bridge, Jr.
Greenwich, Conn.

FLOWERS TO KNOW AND GROW. Audrey Wynne Hatfield. 174 pages, illustrated. Charles Scribner's Sons, New York, 1950. $3.50. (Printed in Great Britain).

This compact little volume was compiled primarily for English gardeners and deals with soil and climatic conditions in the British Isles, but much of the information it contains can be applied to gardens and flowers in the United States, and a careful perusal of it would be helpful to anyone contemplating the making of a garden. The author begins with explicit data about the soil, which is the basis of any garden anywhere. She then takes up the propagation, the planting and the care of the material to be grown. Then follows a series of neatly sketched line drawings of the individual flowers, done by the author, and lightly touched with color. The text under each drawing gives the correct botanical name, some of the history and the origin, often with an interesting anecdotal touch, and the requirements for best culture and results. The information is concise and well-worded, so that even an utter tyro could follow, and one could wish that the author could and would produce an American cousin to the little book for the use of gardeners on this side of the Atlantic.

Louise D. Holton.
Essex Fells, N. J.

FAMILIES OF DICOTYLEDONS. Alfred Gundersen. 237 pages, illustrated, indexed. Drawings by Maud H. Purdy. Chronica Botanica Co., Waltham, Mass., Stechert-Hafner, Inc., New York. 1950. $4.50.

The "Chain of Nature" by which all organisms are more or less related by intermediaries was recognized by some of the older naturalists and received an impetus through the philosophical works of Leibnitz. As early as 1790, diagrams of the natural relationships of plant families were published by Gieseke, a student of Linnaeus. This natural system was further advanced by the Jussieus in France, and Darwin's work in evolution brought into prominence the idea that time as well as space is of importance. This meant that geology (i.e. paleobotany) must be taken into account in the arrangement of plant families. The fossil ancestors are as important as the present representations. The delimitations of plant families at first was concerned mainly with Europe, then as various regions of the world were explored, new families were recognized. At the present time they number about 300. Of these Dr. Gundersen treats 240 families, which means most of the plants outside the grasses, lilies, palm, and orchid groups.

The book, of necessity somewhat technical, as I see it, has two functions. First, it gives a historical survey of the plant families and their present status, which provides a good reference background for those botanists interested primarily in fossil plants, wood anatomy, flower structure, embryology, and plant geography. These subjects are, furthermore,

treated in the introduction by specialists in the groups. Secondly, Miss Purdy's excellent drawings, as well as the text, provide an adjunct for the person who has the task of identifying and classifying plant specimens. This is not a large book but is surprising in the vast amount of information it contains, the labor of many, many years.

The families are taken up in sequence. In each case the geographical distribution is mentioned along with some of the important genera. Then follows a brief description, bibliographic references to the family, and notes chiefly on the evolutionary and morphological aspects of the family. The drawings emphasize development of the flowers. There is an interesting bibliography. The book will be a necessity for those working on the world-wide aspect of descriptive botany and in the various fields of plant evolution.

Henry K. Svenson, Curator
American Museum of Natural History

THE COMING OF THE FLOWERS. A. W. Anderson. 267 pages, illustrated. Farrar, Straus & Young, Inc., New York. 1951. $3.

The fifty-four essays which comprise *The Coming of the Flowers* exhibit an excellent blending of historical data, biographical sketches and horticultural notes. The dry facts of the encyclopedia are brought to life in the current trend of popularization. The human interest touch in the hard luck that seems to have been the lot of the early horticultural explorers should intrigue even the most casual gardener. Nearly every one of the essays would seem to provide a good springboard for a garden club discussion.

In presenting the story of the lilac, Mr. Anderson pays a well-deserved tribute to the Lemoines of Nancy, France, for their selections of seedling variations in *Syringa vulgaris*, a great work which the Lemoine family continues to the present day. However, not all varieties are to be attributed to them, and the two mentioned are not from the Lemoines. Mrs. August Belmont is an American introduction from the Long Island collection of the late Theodore A. Havemeyer and is a variety still rarely seen in collections in this country, while the popular Lucie Baltet originated in the Baltet nursery of Troyes, France.

The drawings do not correspond in botanical excellence to the text. The bougainvillea inflorescence seems more like a fleshy-petaled clematis, the ginkgo leaf is a gross libel, and the artist, who is not named, seems never to have seen forsythia, bitter-root or shortia.

Bernard Harkness
Division of Parks and
Recreation, Rochester, N. Y.

THE BOOK OF TABLE ARRANGEMENTS. Patricia Easterbrook Roberts. 199 pages, illustrated. Crown Publishers, New York 1951. $2.75.

Here is a book to intrigue any woman who ever plans a table setting, whether she is a new bride, a career woman, or an experienced flower show exhibitor.

The many illustrations, some in full color, show table arrangements of all types—modern, traditional, conservative, exotic, formal, informal, budget and opulent. Equally pleasing effects have been obtained by using inexpensive cloths and appointments with simple flowers, fruits, foliage or dried materials, and the most luxurious laces and linens with orchids, gardenias and camellias.

The experienced arranger finds her imagination stimulated by the wealth of original ideas and suggestions. For the novice there are detailed instructions on each complete table setting, as well as the focal arrangement.

A valuable addition to the book is a section containing instructive chapters on table setting technique, suggestions for suitable plant material and how to obtain it, and the mechanics of making a flower arrangement.

Katherine Cutler
Westfield, N. J.

GARDENING HANDBOOK. T. H. Everett. 144 pages, illustrated, indexed. Fawcett Publications, New York. 1951. 75c.

Compressed into this *Gardening Handbook* is a wealth of information which T. H. Everett has gained from years of experience as a practical gardener, exponent and teacher of horticultural practice. Evidently compiled with the idea in mind of helping the beginner avoid many of the pitfalls that beset him, be they mechanical or horticultural, the author has succeeded admirably by putting into print instructions that are basically correct, and presented in a clear and readily understandable manner. The title of this small book adequately describes its intent, which is that of a reference work in which one can find the answers to his problems quickly and easily.

The chapter on garden soils, which includes instructions on the drainage of ground, correct ways to dig, preparing for planting and seeding, how to improve the ground by organic material, is particularly interesting. So are those on trees and shrubs, lawn care, composting, raising plants from seedlings and cuttings, which comprise only a few of the various chapters devoted to the uses and applications of gardening practices.

A feature of this book, one of real value to the layman, is the generous use of illustrations. Each item under discussion is graphically, either by photographs or drawings, portrayed.

Offered at a price which places it within the reach of all, this book could, to advantage, be added to the library of a beginner or veteran gardener. It contains much material that is valuable in a ready reference form not only as to technique but also lists, for instance, the uses of fertilizer and sprays, a calendar of operations for the entire year, etc.

Edwin Beckett, Horticultural Director
Berkshire Garden Center.

HOW TO GROW VEGETABLES. Lloyd C. Cosper and Harry B. Logan. 263 pages, drawings and photographs by Lynette Arouni; indexed. Duell, Sloan & Pearce, New York. 1951. $3.50.

Having gone over this work carefully and thoughtfully, I have this to say about it — I consider it a most useful and deeply interesting book on vegetable culture as well as on the harvesting of vegetable crops, the freezing and canning of same. No doubt, it will be of the greatest interest to the beginner in vegetable gardening. I really consider it the amateur's A. B. C. book on kitchen gardening as well as on fruit.

The sections devoted to fruits are very lucid and easily understood. The illustrations are good and clearly show what is represented. The part on insects and plant diseases is also well done.

The Appendix is one of the best I have seen; in fact, it is a world of information in itself.

This book really ought to be in the hands of every "Liberty Gardener" throughout the nation.

James B. Jack
Mt. Kisco, N. Y.

The Garden's Supporting Cast

(*Continued from page* 155)

himself Yiddish and is sometimes seen reading a Yiddish newspaper. When he isn't reading, Mr. Drescher has other projects with which to occupy himself. A few months ago he wrote an article on the wild life refuge at Bulls Island, South Carolina, which was printed in The Garden Journal. He collects feathers of exotic birds, despite the vehement objections of his wife, who claims she is not interested "in establishing a home for homeless moths". He also constructs bird houses on which he lavishes the utmost patience and care.

But "birding" is still Mr. Drescher's main hobby. He has observed birds and their habits from Quebec, Canada, to Titusville, Florida. He began studying them seriously when his son was a young boy. They found it annoying not to know many of the birds they saw, so Mr. Drescher bought a pair of field glasses and a few Audubon books, and father and son started "birding". "In those days, we spotted birds that doubtless never existed," he recalls, "but we had a lot of fun doing it."

Apparently, such a hobby is not for sissies. On one field trip in the Newark meadows, Mr. Drescher stepped into a hidden mud channel. Grasping some reeds, he began slowly pulling himself to solid ground. "For a while, I thought my future observations of bird life would be conducted from very high up or from way down below", he says. Fortunately, however, he was seen, and a man maneuvered some planks to him, which speeded up the rescue. Another time, at Kensico, Mr. Drescher was pinned down by a rock and was unable to extricate himself for a half hour. There have been humorous aspects to his field trips, too. A couple of times during the Prohibition era, when our amateur ornithologist was walking along a lonely strip of coastline with field glasses in his hand, suspicious inhabitants mistook him for a revenue officer in search of rum runners. Such encounters were anything but friendly.

Such problems do not confront Mr. Drescher when he roams through The New York Botanical Garden. Every day, before he takes over his duties as watchman, he walks around the park for an hour or so, noting the plants and feeding the birds. During the May migrating season, Mr. Drescher may be hard to find. But his friends never doubt the fact that he is in the Garden — he practically lives here during the month. For this reason he says he will not be surprised if his ghost is seen down by the Bronx River after he has passed on to another world.

Address your questions to *The Question Box, The Garden Journal of The New York Botanical Garden*, Bronx Park, New York 58, N. Y.

Q. One day recently dark blotches appeared on the leaves of rose, fig, lilac and magnolia in our garden. What is the disease?

A. Most plant diseases — certainly most leaf diseases — are caused by fungi too selective to have attacked so many unrelated plants at once. The trouble is soot, which probably fell during wet weather and spread out on the leaf surface.

Donald P. Rogers, Curator.

Q. What is happening to the leaves of my witch-hazel trees?

A. The witch-hazel leaves you submitted showed the so-called cone gall, which is caused by an aphid. The eggs of this aphid overwinter on the twigs. In the spring when they hatch, the young aphid feeds on the lower leaf surface. The irritation resulting from this feeding causes these galls.

They are rarely, if ever, destructive enough to warrant control measures although you might try a dormant oil spray in late spring.

P. P. Pirone, Plant Pathologist.

Q. Rhododendrons and other plants growing beneath my tulip-poplar tree are frequently covered with a black, soot-like material. Is this harmful and how can I get rid of it?

A. This is actually a fungus known as sooty mold, which does not parasitize the leaves but lives on the sticky substance secreted by aphids and scales from the tulip tree. Lindens and maples do the same. Sooty mold is not removed very easily but can be controlled by spraying with a standard wettable sulfur spray. This is only a temporary remedy, however, for the insects must be controlled and the source of food for the fungus thus eliminated. Leaves covered for too long a period with the sooty mold do not get the light they need to manufacture food. Hence their efficiency is impaired and some leaves may actually turn yellow because of lack of light.

P. P. Pirone, Plant Pathologist.

Q. The tomato plants in our patch have grown well and set many small fruits. With the coming of dry weather many of the tomatoes have developed an irregular dry leathery blackish spot around the blossom end. The plants have been watered every other day, and during the dry weather have been hoed six inches deep. What is the disease? Will it infest other tomatoes? How can it be controlled?

A. The disease is blossom-end rot; it is caused by lack of water and not by any parasite, and therefore will not infect other tomatoes. The control in this garden must be based on the realization that a plant can suffer from drought in the presence of abundant water. The too-frequent sprinkling caused the plants to develop nearly all their roots in the upper few inches of soil. The deep hoing then cut off most of the roots, and since the plants had lost the greater part of their absorbing system, they suffered from acute lack of water. These plants should be watered only rarely (and then given a full inch of water); they should either be mulched or else the upper half-inch of soil only should be stirred. With a deep root system plants can usually take care of their own water-supply.

Donald P. Rogers, Curator

News, Notes and Comments

Educational Program. September 8th is the date of the opening of the Autumn 1951 term of the Educational Program at The New York Botanical Garden. Courses are offered in Field Botany, Nature Study for Teachers, Mushroom Identification, Systematic Botany, Plant Pests and Diseases, Landscaping the Home Grounds, Fundamentals of Gardening, Flower Arrangement, Flower Painting.

Copy of the program may be had by addressing The New York Botanical Garden, Bronx Park, New York 58, N. Y.

Saturday Afternoon Lectures. Interesting programs have been arranged for the Autumn 1951 Saturday Afternoon Lectures. On September 29, through the courtesy of Australian News and Information Bureau, three sound motion pictures in color will be shown: Marvels in Miniature, Feathered Fishes, and Coral Wonderland. On October 6, Dr. Bassett Maguire, Curator of The New York Botanical Garden, will give a talk on Garden of the Gods of Venezuela, illustrated with kodachromes.

The lectures are held in the Lecture Hall of the Museum Building at 3:30 P. M. Complete program may be had by addressing The New York Botanical Garden, Bronx Park, New York 58, N. Y.

The New York Botanical Garden Pays Tribute to Paris on Her 2,000th Birthday. Ceremonies were held at Idlewild Airport on July 12 immediately preceding the flight to Paris of a bouquet of flowers and an embossed scroll containing the signatures of the Governors of the forty-eight States and the President of The New York Botanical Garden. The gifts were taken to Paris by Mrs. Margaret Biggerstaff, Promotion Director of The New York Botanical Garden.

Hon. John Lodge, Governor of Connecticut, spoke extemporaneously in French as well as giving his formal address in English. Madame Roger Seydoux, wife of the Consul-General for France, received the flowers. Madame Seydoux was escorted by Jacques Grellet, Vice-Consul for France. Among the other guests were Bartow Underhill, Chief of the Department of State in New York City, Dr. J. W. A. Hattum, Consul for The Netherlands, Charles B. Harding, President of The New York Botanical Garden, Laurence Gerosa, President, Walter J. Holmes, Vice-President, and other officials of the Bronx Chamber of Commerce.

Horticulturist Abroad. T. H. Everett, Horticulturist of The New York Botanical Garden was a guest judge at the Flower and Country Show at Olympia, England, on July 26, 27 and 28, which was sponsored by the "Evening News" of London. Flowers from all parts of the world were displayed, including an exhibit from the United States of black-eyed Susans sent by The New York Botanical Garden and of marigolds and zinnias supplied by W. Atlee Burpee Co. While abroad, Mr. Everett lectured before several horticultural organizations on The New York Botanical Garden and American gardens in general.

Distinguished Visitor. Nicolas Castellanos, Mayor of Havana, Cuba, visited The New York Botanical Garden this summer.

Mrs. Samuel Sloan. Mrs. Samuel Sloan who has been a member of the Advisory Council since April 19, 1923, and of the Corporation of The New York Botanical Garden since January 12, 1931, died July 18, 1951. Mrs. Sloan had played a very active part in the affairs of the Garden

(*Continued on page* 161)

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FROM THE HERB SHELF

AVOCADO MOUSSE

1 tablespoon gelatin
¼ cup cold water
¼ cup hot chicken broth
½ teaspoon salt
1 teaspoon minced parsley
½ teaspoon minced fresh marjoram
2 large avocados
1 head endive

Soak the gelatin in cold water and dissolve in hot broth. Add salt and herbs. Peel and mash avocados and mix with gelatin and herbs till very smooth — the lowest speed of the electric mixer gives best results. Store in a ring mold in the refrigerator. To serve, unmold on a crystal platter, surround with endive and fill the center of the mold with mayonnaise over which is sprinkled finely-cut chives.

Isabella Gaylord.

Sweet marjoram (*Origanum Majorana Majorana hortensis*) has long been a favorite herb. Because it "covers otherwise barren slopes of its native rocky headlands along the Mediterranean shore," the people of ancient Greece called the plant *Origanum*, which means "delight of mountains" or "mountain joy."

"And though sweet marjoram will your garden paint
With no gay colors, yet preserve the plant,
Whose fragrance will invite your kind regard
When her known virtues have her worth declared;
On Simonis' shore fair Venus raised the plant,
Which from the goddess' touch derived her scent."

This erect, woody, many-branched herb has grey-green, oval leaves and bears small, whitish flowers in midsummer. Marjoram is used in perfume, soaps, and toilet waters but is familiar to most people as a condiment, especially in soups, stews and poultry dressings. It grows best in a light dry soil. Marjoram is a perennial herb but since it winter-kills easily, is usually treated as an annual.

News, Notes

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Club of America, having served as president (1921-5), vice-president (1919-20), director (1926-32) and on a number of committees; she was a member of the Committee on Redwoods (1934-51). In 1946, Mrs. Sloan gave her estate, Lisburne Grange, at Garrison, N. Y., to Vassar College.

Guggenheim Fellow at The New York Botanical Garden. Brother Alain, a native of France who has been living in Cuba the past seventeen years, where he has been working with Brother Leon on *The Flora of Cuba*, spent the summer at The New York Botanical Garden on a Guggenheim Fellowship. The fellowship runs for two years, so Brother Alain will return to the Garden next summer. During the school year, he teaches at Colegio de la Salle in Havana. Volume II of *The Flora of Cuba* was published early this summer and Brother Leon and Brother Alain have begun the third volume.

Membership in

THE NEW YORK BOTANICAL GARDEN

and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid in a single year, unless otherwise stipulated.

A subscription to The Garden Journal (published bimonthly) and to Addisonia (issued irregularly).

Admission to Members' Day programs and use of the Members' Room also at other times.

Admission to previews of Flower Shows and Exhibits held at the Garden.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

A membership card which serves as identification at special functions at The New York Botanical Garden and also when visiting similar institutions in other cities; which allows 10 free rides upon the Garden's tractor-train, *The Floral Flyer*. Also, on presentation of membership card, parking fee on weekends is waived.

Garden clubs may become Affiliate Members of The New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

Business firms may become Industrial Members of The New York Botanical Garden. Information on the classes of Industrial Membership and the privileges of membership will be sent upon request.

Classes of membership in The New York Botanical Garden are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

Contributions to the Garden are deductible from taxable incomes and in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York Chapter 285 *of* 1891, *the sum of*.....

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to

THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York 58, N. Y.